
DSM2 Calibration/Verification

Calibration-Validation Scheme

Two types of model runs are used to calibrate and validate DSM2. For both Hydro and Qual, a realtide run, based on historic, observed data, may be used. In this mode, 15 minute or hourly historic stages and ECs are used for Hydro and Qual at the downstream boundary (Martinez), and hourly or daily historic flows and water quality values are used for rim locations, pumping, and internal sources and sinks such as agricultural diversions, drainages, and seepage from channels to islands. Gates are operated according to historic timing data. Typically realtide runs are several months or a year in length.

A planning run is used primarily to calibrate and validate Qual. In this mode, a 19-year repeating mean tide is used as the Martinez stage boundary in Hydro. Monthly averaged flows and exports are used instead of daily flows. Gates are fixed in one position for each month. A tidefile is generated for each month, representing the average tidal flows for that month. A series of tidefiles are thus generated, and Qual run over the series. Planning runs are usually 15-25 years in length.

Calibration Description

The most recent calibration, finished in July 1997, is a relatively small adjustment to the first calibration of DSM2, finished in June 1997 and documented in our 1997 Annual Progress Report. This recalibration was needed because of a generalization and more accurate treatment of irregular cross-sections within DSM2-Hydro. The changes made with respect to the previous calibration were to decrease Manning's N coefficients in the Suisun Bay and lower Sacramento River, and to increase the dispersion coefficients in the lower San Joaquin River. Both coefficients in those areas are now somewhat more realistic, and it illustrates indirectly once again the importance of having a realistic channel bathymetry. Additional information on the calibration and validation of the model can be found on the section's world wide web home page: <http://wwwdelmod.water.ca.gov>.

DWR/Delta Modeling Section

Delta Simulation Model II - Calibration Plots

This section provides detailed plots of the DSM2 Hydro and Qual calibration periods.

Delta Simulation Model II - Hydro Calibration

Hydro: Stage amplitude, instantaneous flow, and residual flows are provided for comparison to observed data.

Stage Amplitudes

We find it helpful to plot the daily maximum and minimum amplitudes of stages to see how well the downstream boundary tidal stage at Martinez propagates upstream into the estuary. Flows, and thus salinity, are quite sensitive to how the stage is propagated—an attenuated propagation will reduce tidal flow excursions and reduce ocean salt intrusion. Stages are easily attenuated by increasing channel friction (Manning's N coefficient).

- Martinez-Mallard Is.
- Antioch-Three Mile Slough
- Collinsville-Rio Vista

Flows

Four different time periods were used to compare computed with observed flows: May 1988 (mostly tide cycle measurements), December 1992-January 1993, May 1994-July 1994, and October 1994. Different periods were required to cover a range of barrier operations and available data.

May 1988-Instantaneous Measurements

- San Joaquin R. @ Hwy 4-Old R. blw Tracy Rd.
- Old & Middle R. @ Bacon Is.
- Columbia & Turner Cuts
- Grantline Canal-Old R. nr. Clifton Ct. Forebay
- Piper & Dutch Sl.
- Three Mile Sl.-Jersey Pt.
- Potato Sl.-Honker Cut
- North & South Fork Mokelumne R.
- Georgiana Sl.
- Miner & Steamboat Sl.
- Sacramento R. South of Decker Is.

North Delta

- Sacramento R. abv DXC, blw Georgiana Sl. (resid)
- Delta Cross Channel (resid)
- Steamboat+Sutter Sl.-Cross Delta (resid)
- Sacramento R. @ Freeport,DXC,Georgiana Sl. (inst)
- Sacramento R. @ Freeport,DXC,Georgiana Sl. (resid)
- Sacramento R. abv DXC, blw Georgiana Sl. (inst)
- Sacramento R. abv DXC, blw Georgiana Sl. (resid)

Jersey Point—Three Mile Slough

- Three Mile Sl.-Jersey Pt. (inst)
- Three Mile Sl.-Jersey Pt. (resid)
- Three Mile Sl.-Jersey Pt. (inst)
- Three Mile Sl.-Jersey Pt. (resid)

Central Delta

- Central Delta (resid)
- Old R.-Middle R. (inst)
- Old R.-Middle R. (resid)

Delta Simulation Model II - Qual Calibration

Qual: In general the plots for this run are an improvement over the previous calibration, more so in the Western Delta where the exaggerated increased salinity in the Suisun Bay has been tempered to only a moderate increase. As a result, salinities in the lower Sacramento River are lower than observed, and a little lower even than the previous run, though we believe still acceptable.

Real-Tide EC

The period January to August 1992 was chosen to calibrate DSM2 using real (observed) tides (stages) at Martinez, along with observed hourly salinity at Martinez. Daily rim hydrologies were used, as well as historic gate timings. However, we may have incorrect data or model operation with respect to the barriers in the Southern Delta (Old and Middle River); see the Union Island plot as an example.

- Mallard Island and Collinsville
- Emmaton and Rio Vista
- Antioch and Jersey Point
- Holland Tract and Contra Costa Canal Pumping Plant #1
- Victoria Island and Union Island
- Stockton and Mossdale

Planning EC

A Planning EC run differs from a real tide run in two significant respects: the downstream stage is a 19-year averaged stage, period 25 hours, in which the stage at t=26 hours is equal to the stage at t=1 hour; and rim flows and gate operations are monthly averages or approximations of historic data. Thus, a Planning Qual run is not intended to strictly simulate a historic condition. Nevertheless it is still useful to compare such a run to historic data to see general trends over many years of different hydrologies.

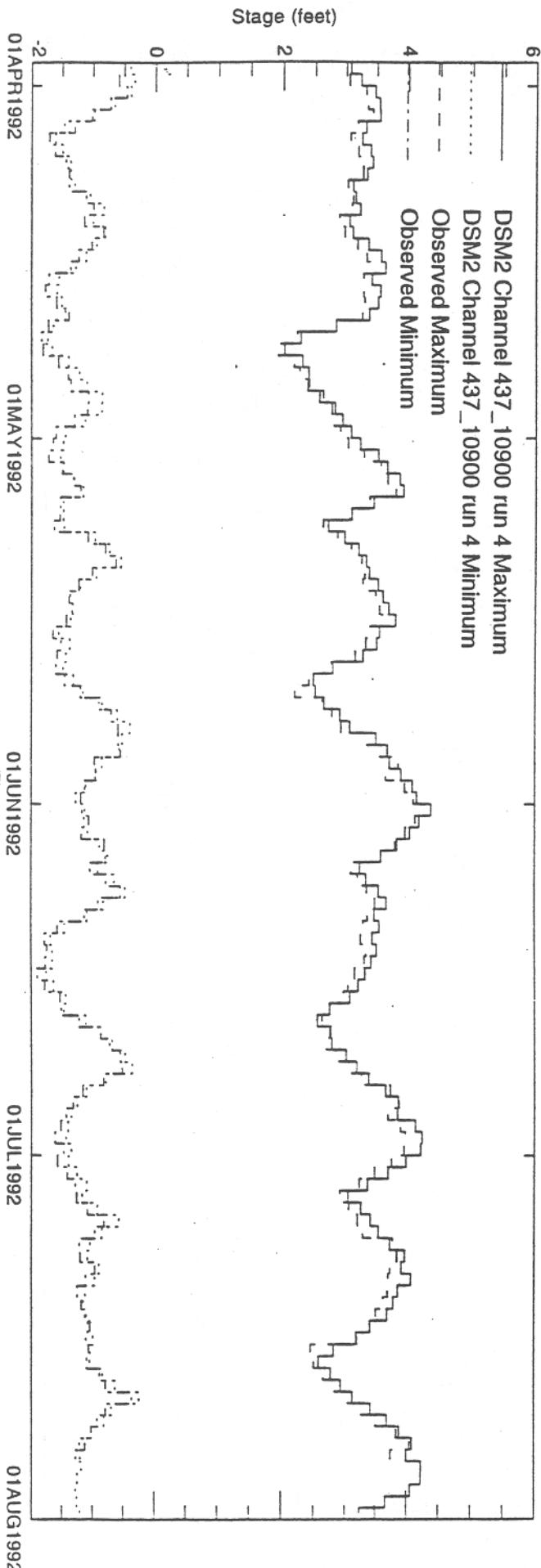
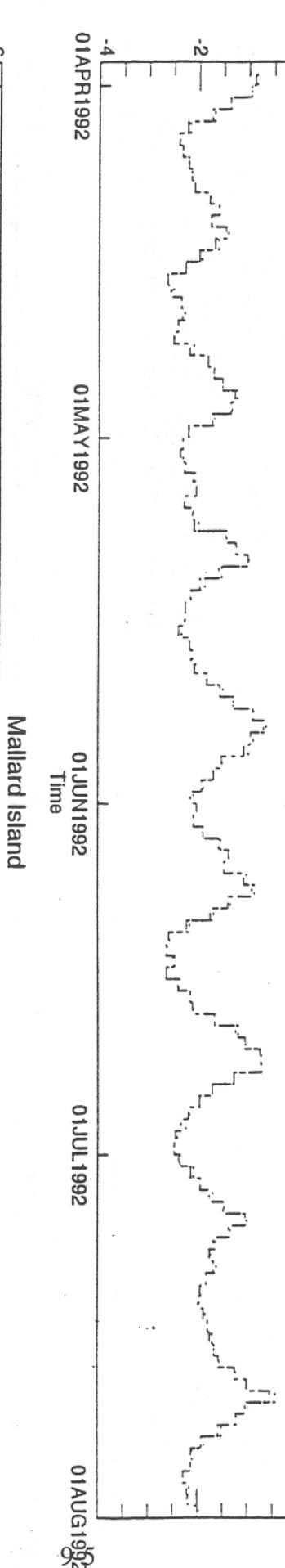
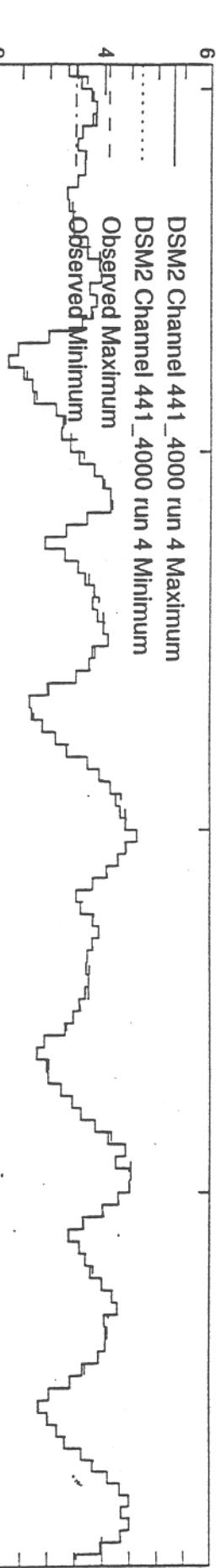
1968-1991

- Mallard Island and Collinsville
- Emmaton and Rio Vista
- Antioch and Jersey Point
- Holland Tract and Contra Costa Canal Pumping Plant #1
- Victoria Island and Union Island
- Stockton and Mossdale

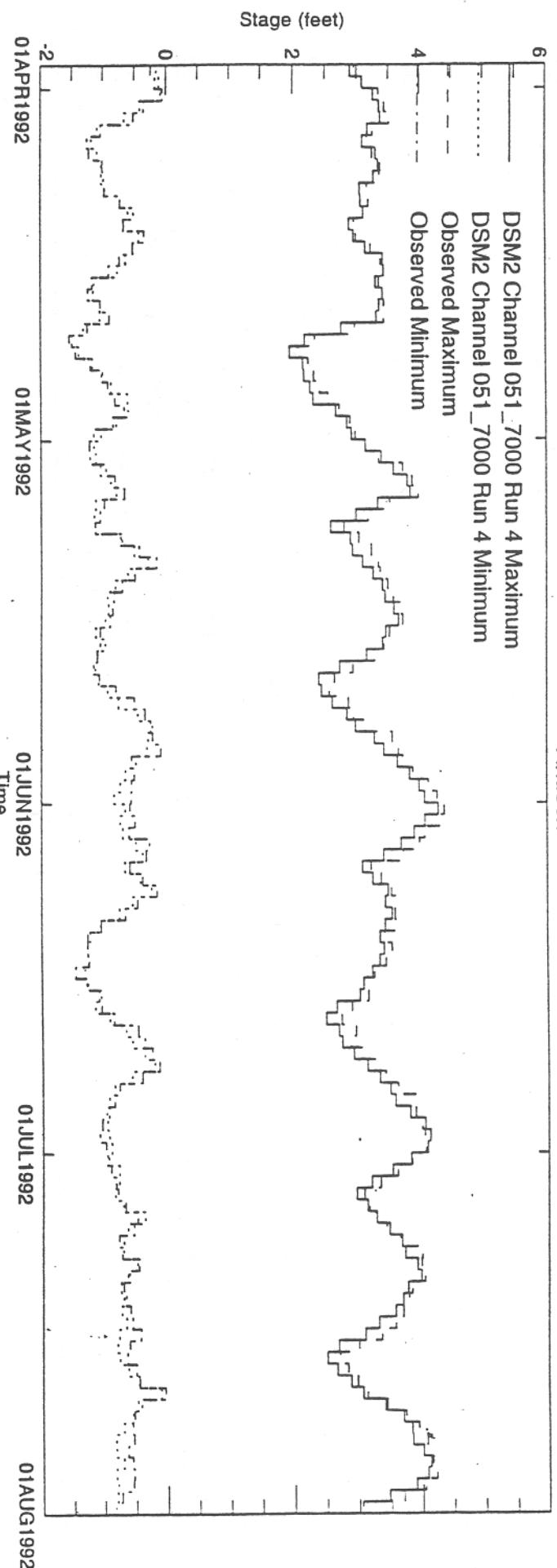
1985-1991

- Mallard Island and Collinsville
- Emmaton and Rio Vista
- Antioch and Jersey Point
- Holland Tract and Contra Costa Canal Pumping Plant #1
- Victoria Island and Union Island
- Stockton and Mossdale
- CCC Mismatch Comparison: 1968-1991

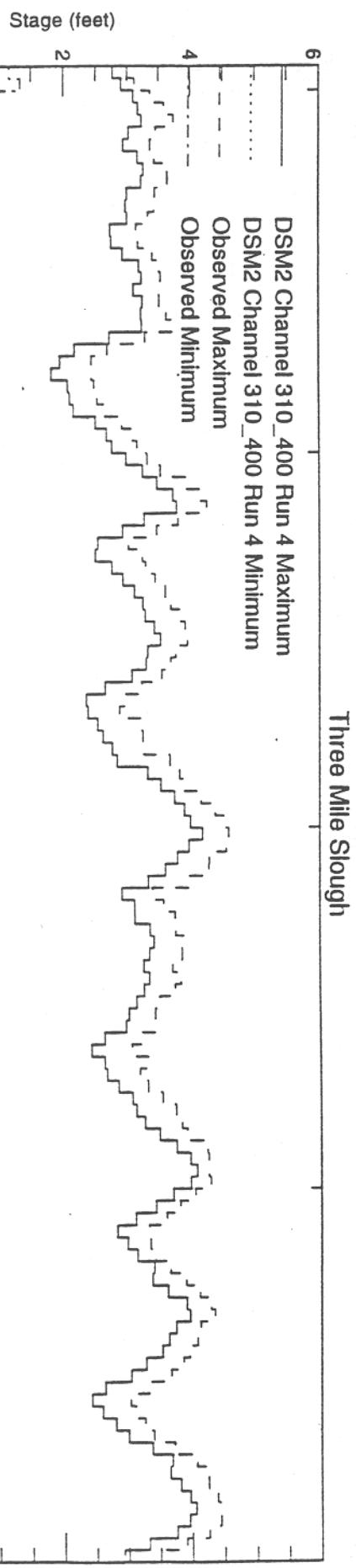
Martinez



Antioch



9-6



01APR1992

01MAY1992

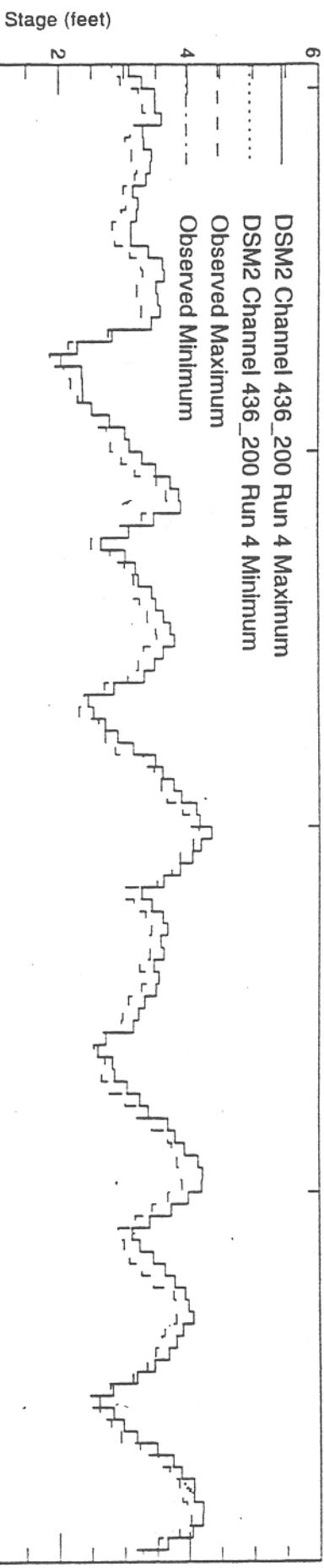
01JUN1992

01JUL1992

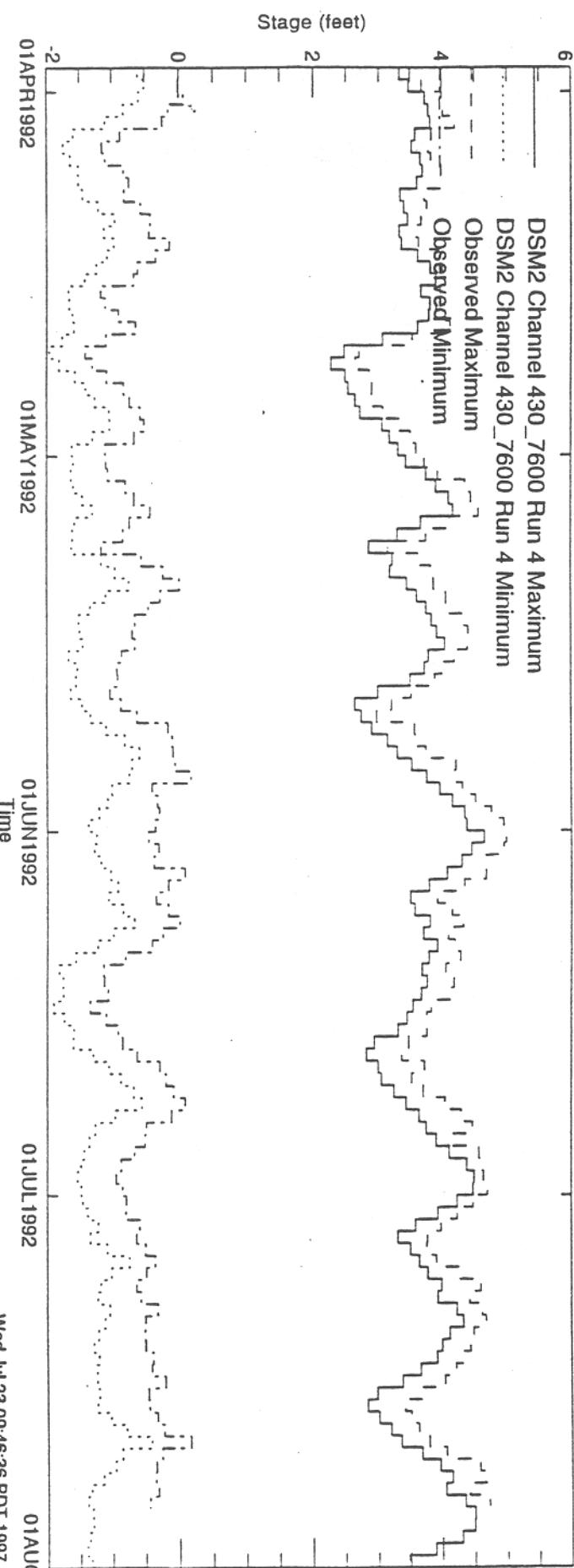
01AUG1992

Wed Jul 23 09:34:26 PDT 1997

Collinsville



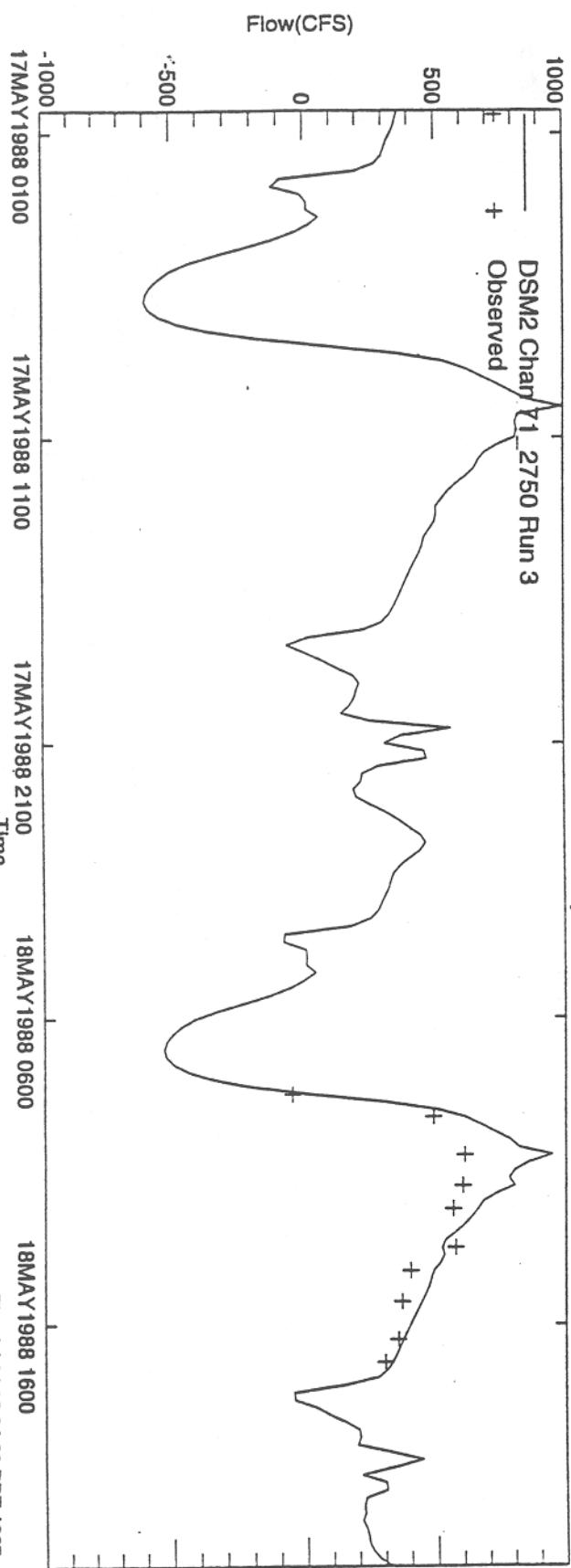
Rio Vista



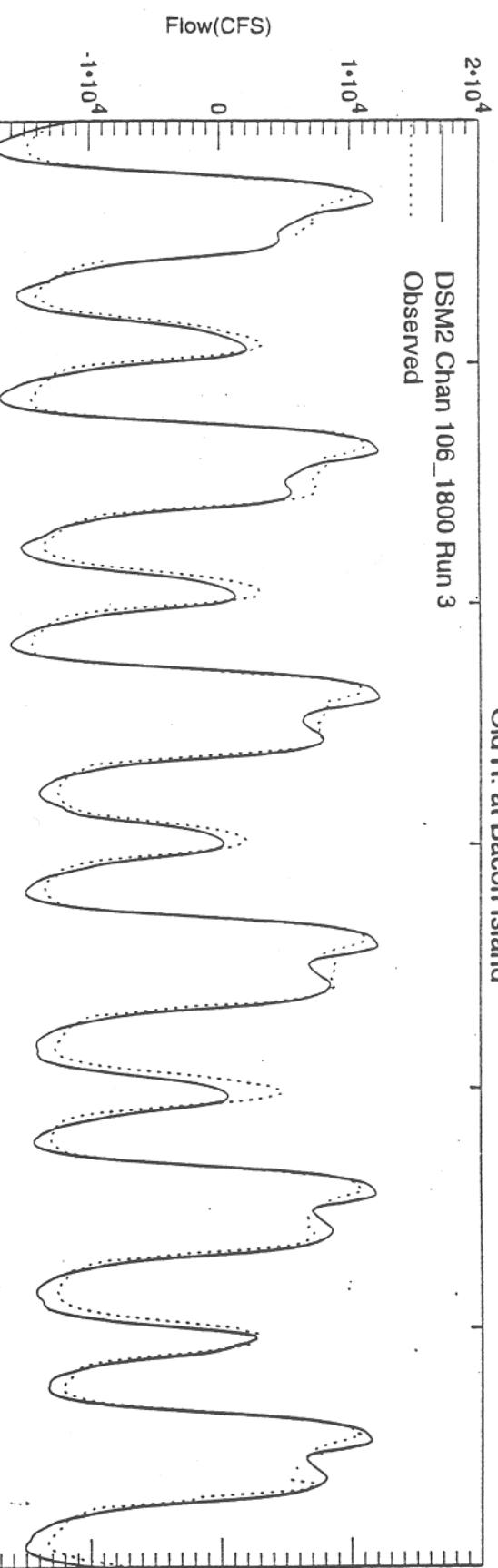
San Joaquin R. at Highway 4



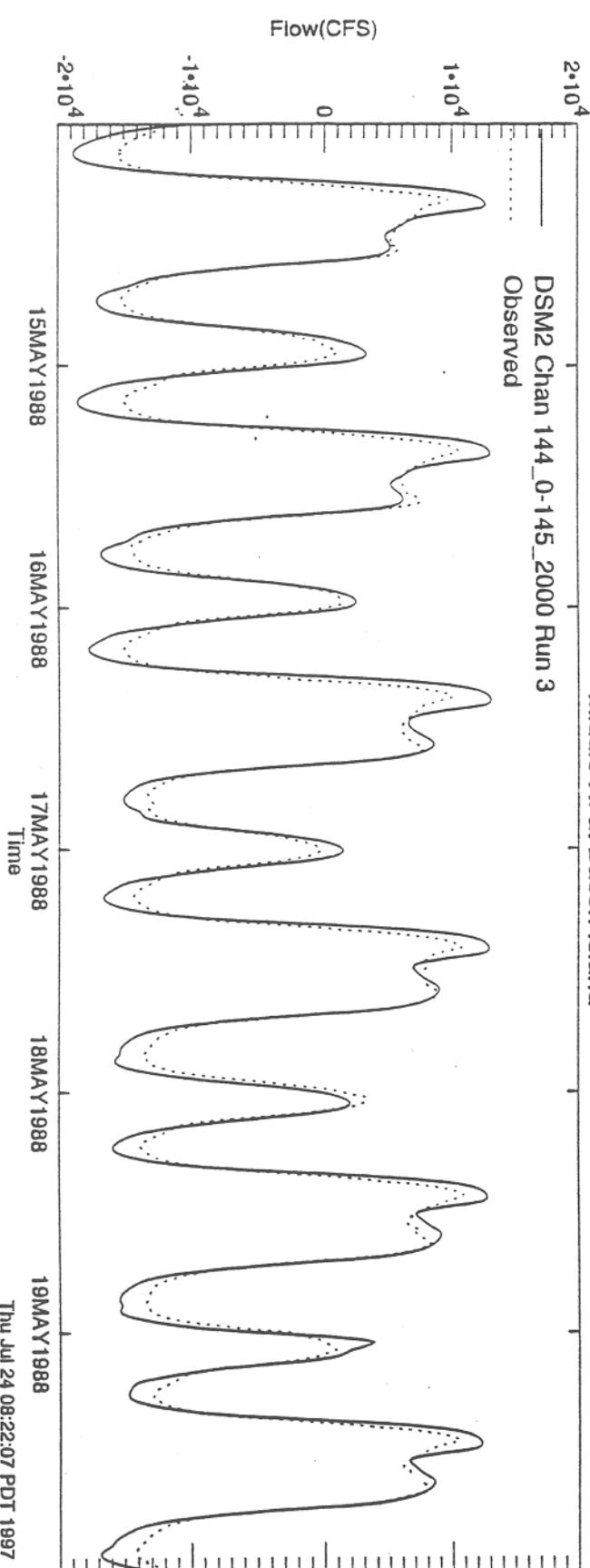
Old R. below Tracy Road

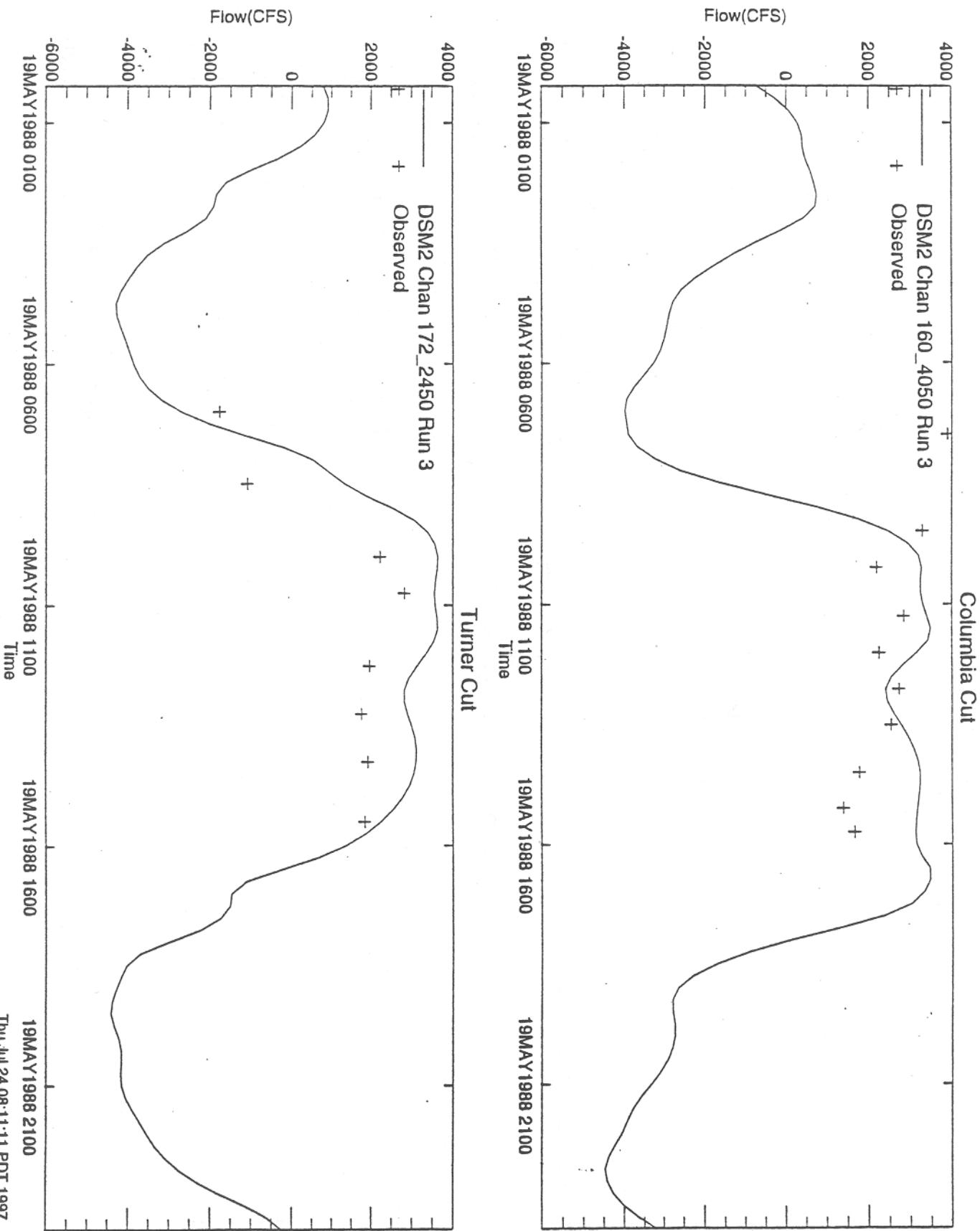


Old R. at Bacon Island

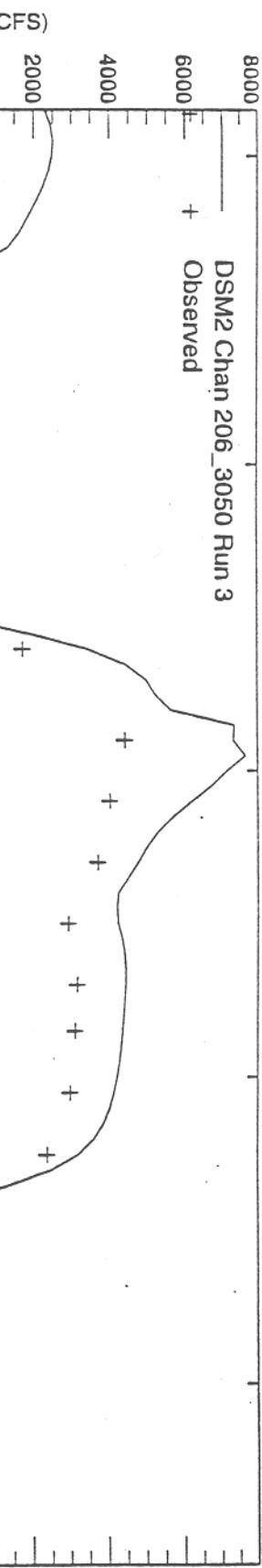


Middle R. at Bacon Island

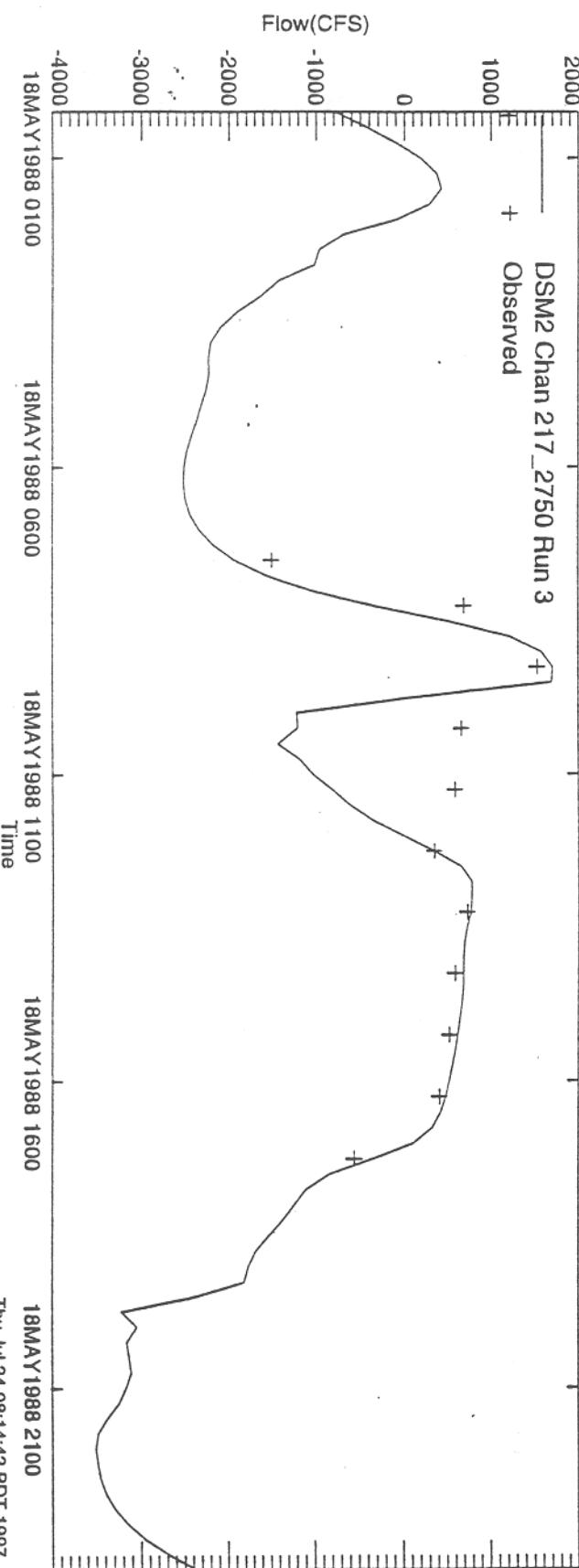


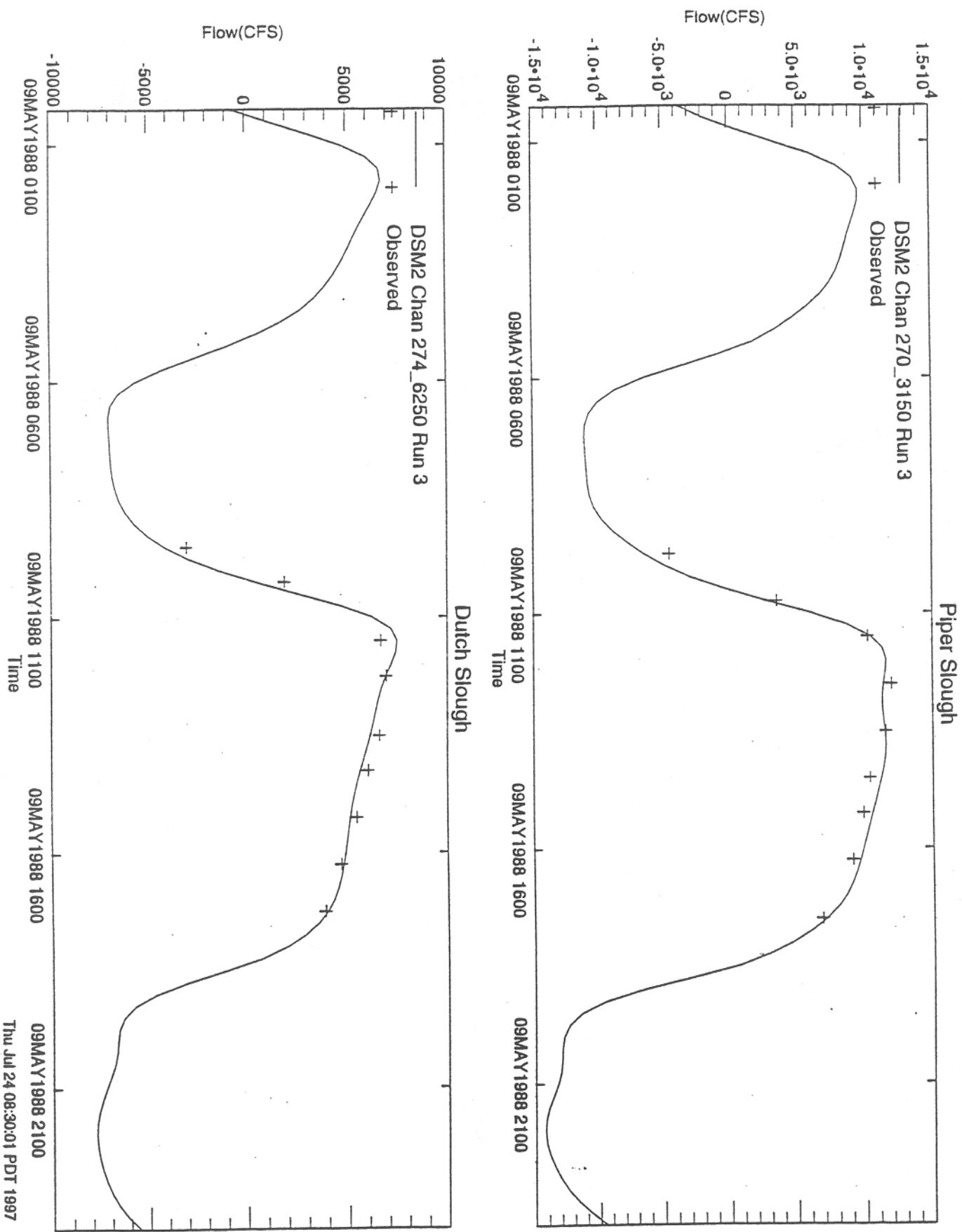


Granline Canal

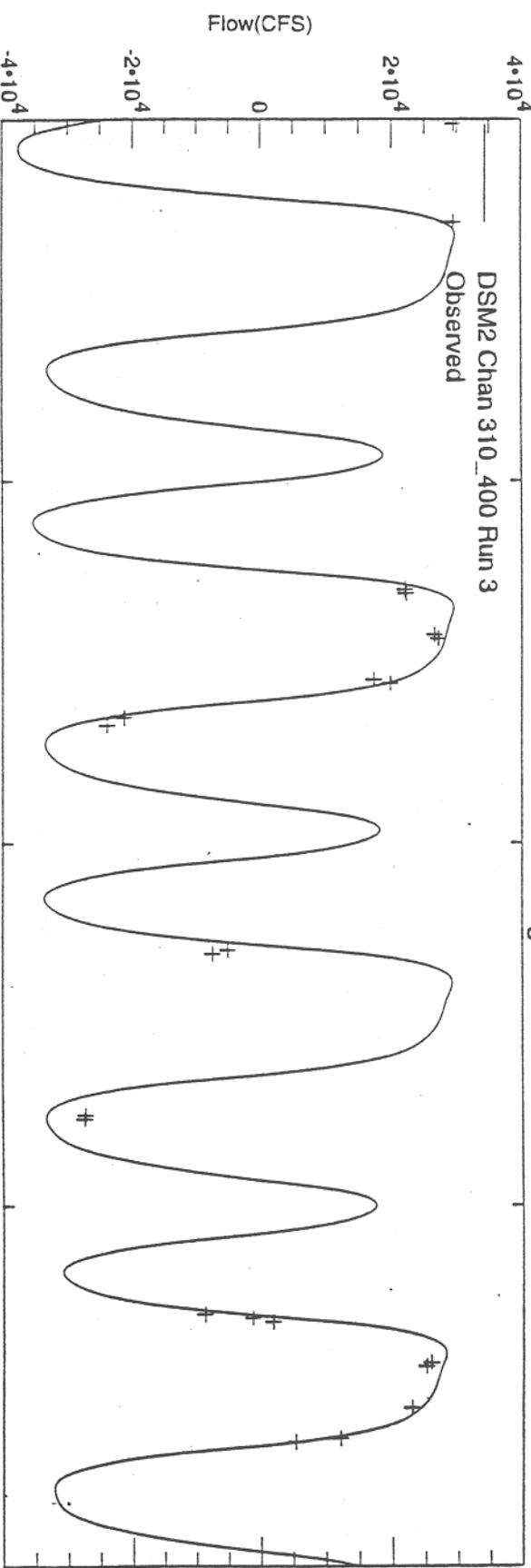


Old R. near Clifton Court Forebay

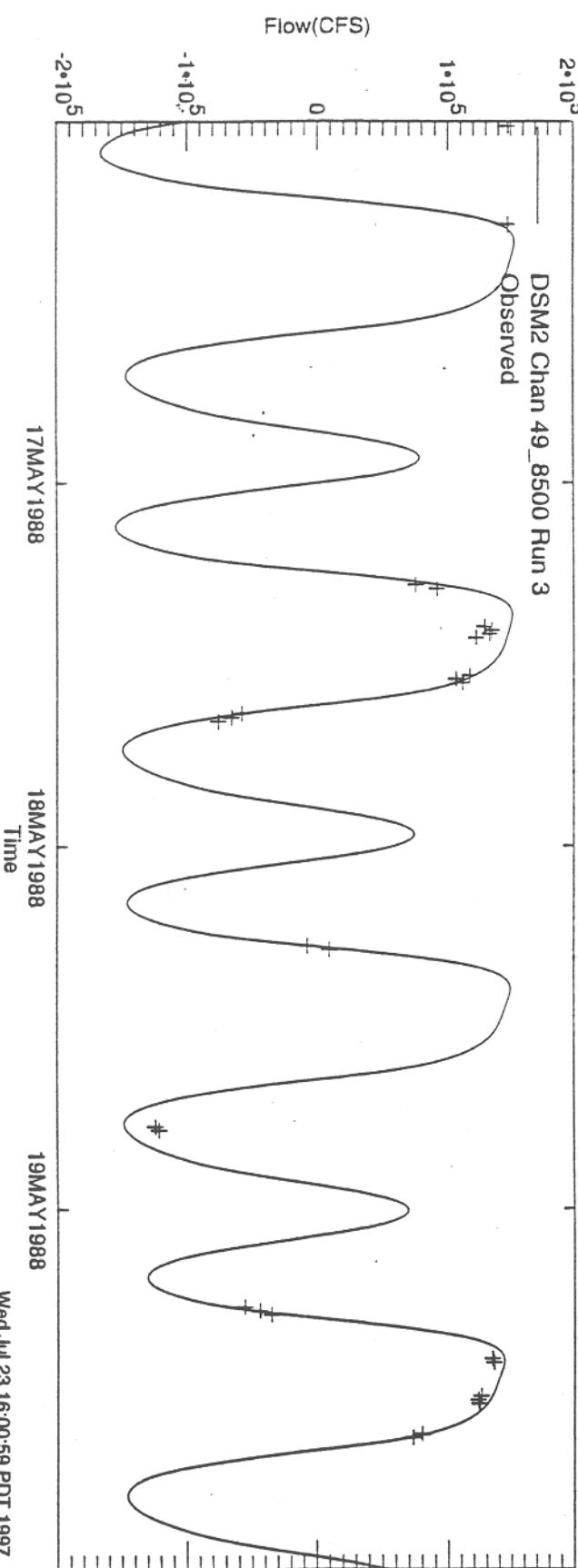


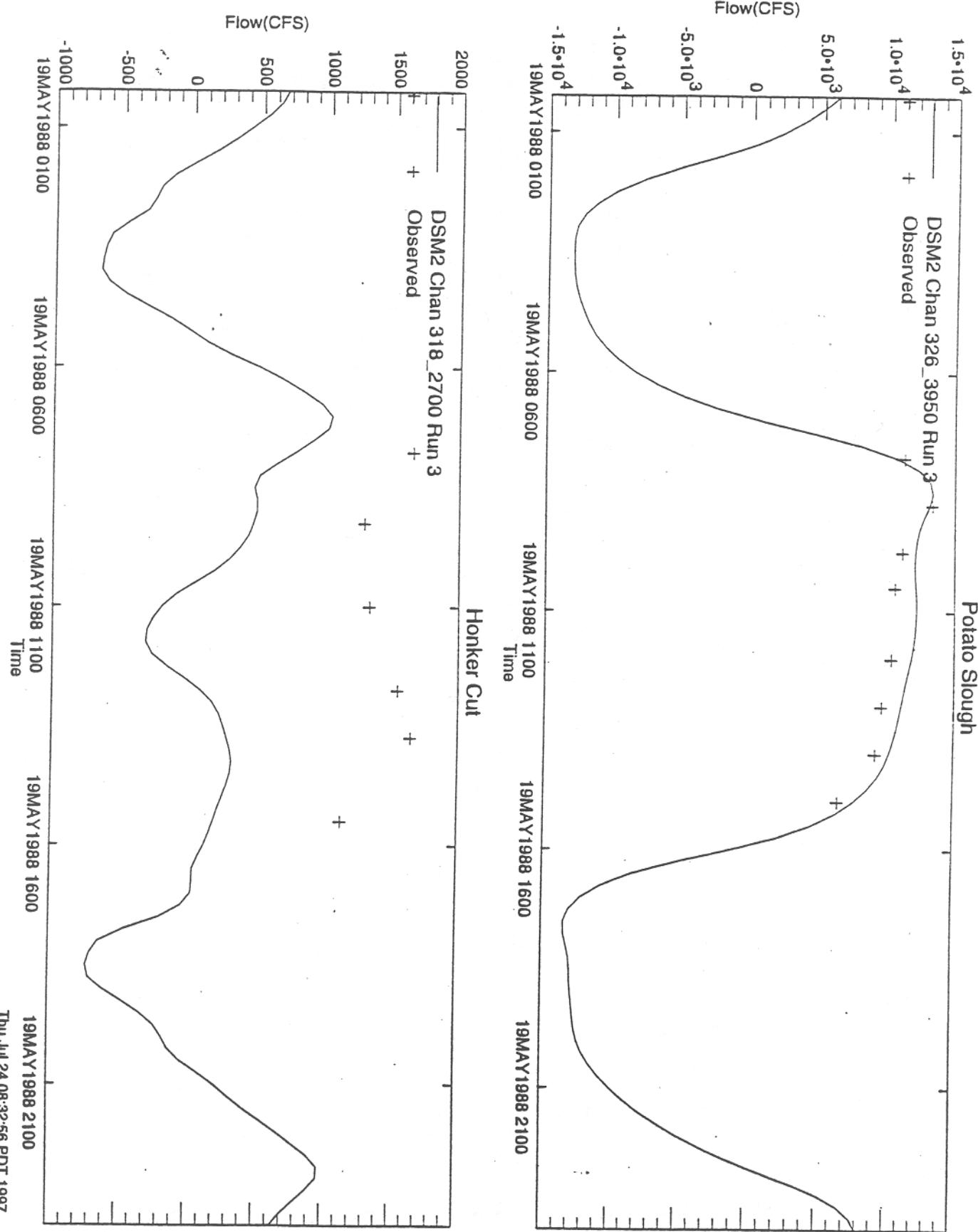


Three Mile Slough

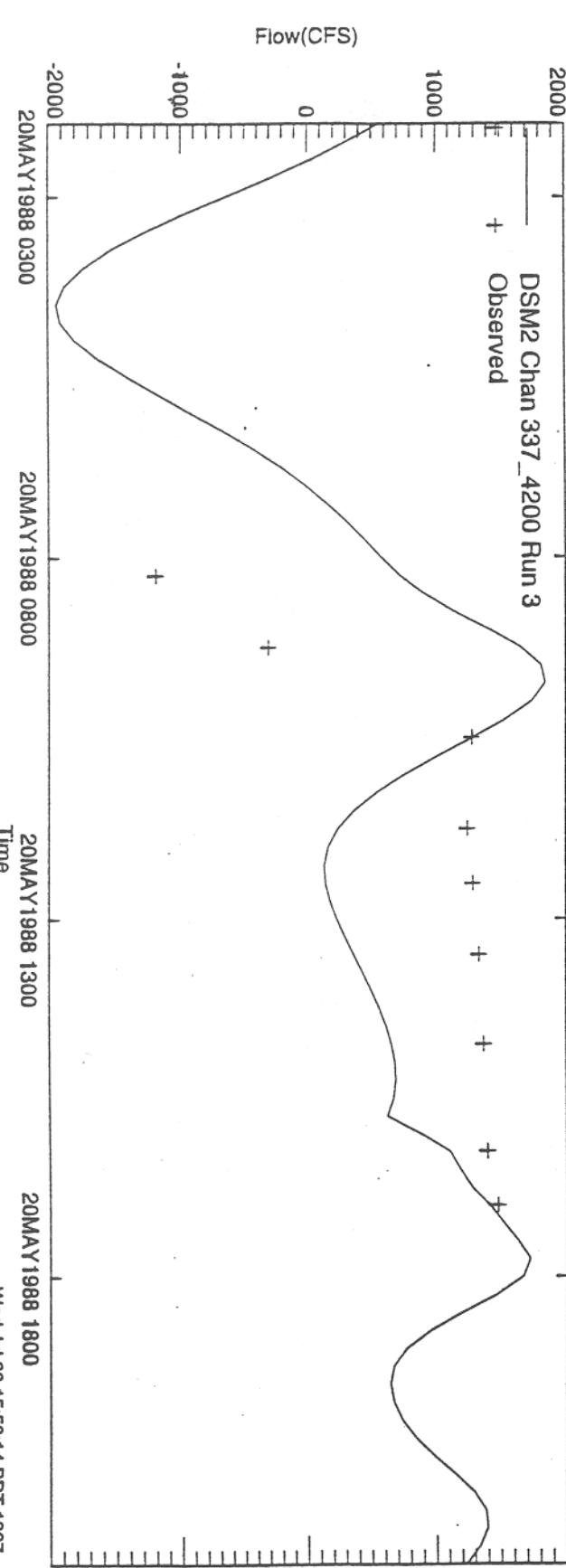
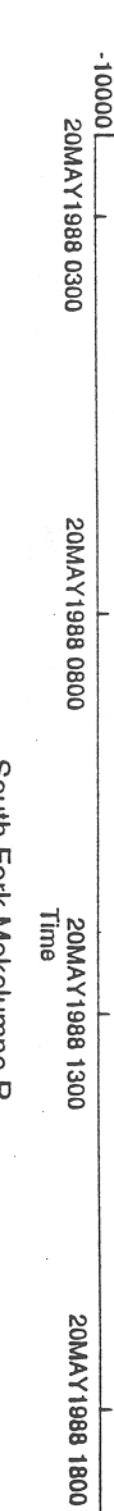
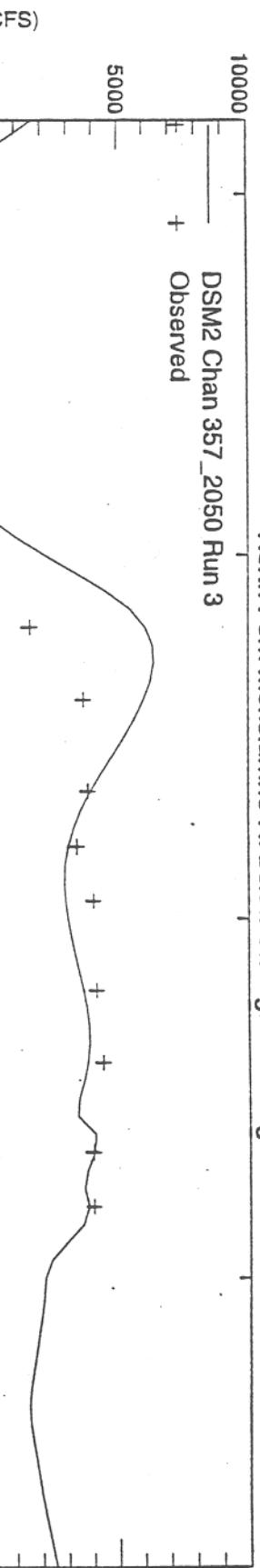


San Joaquin R. at Jersey Point



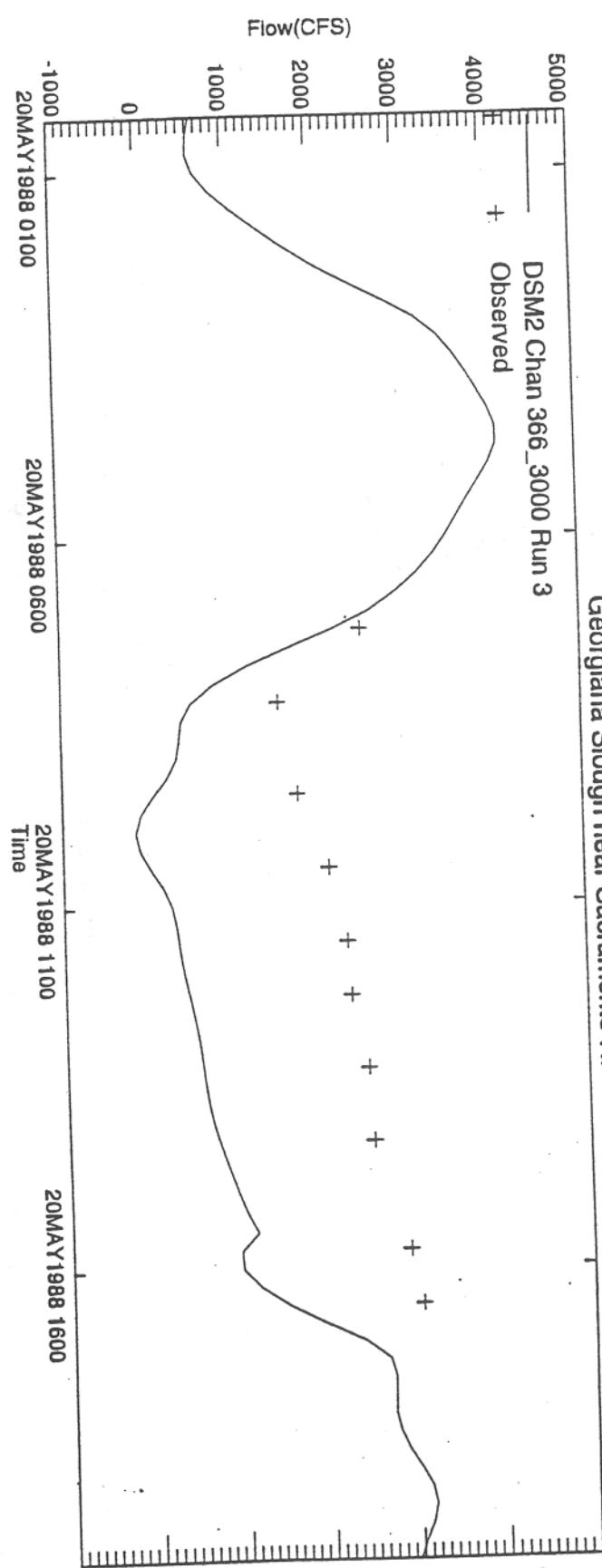


North Fork Mokelumne R. below Snodgrass Slough

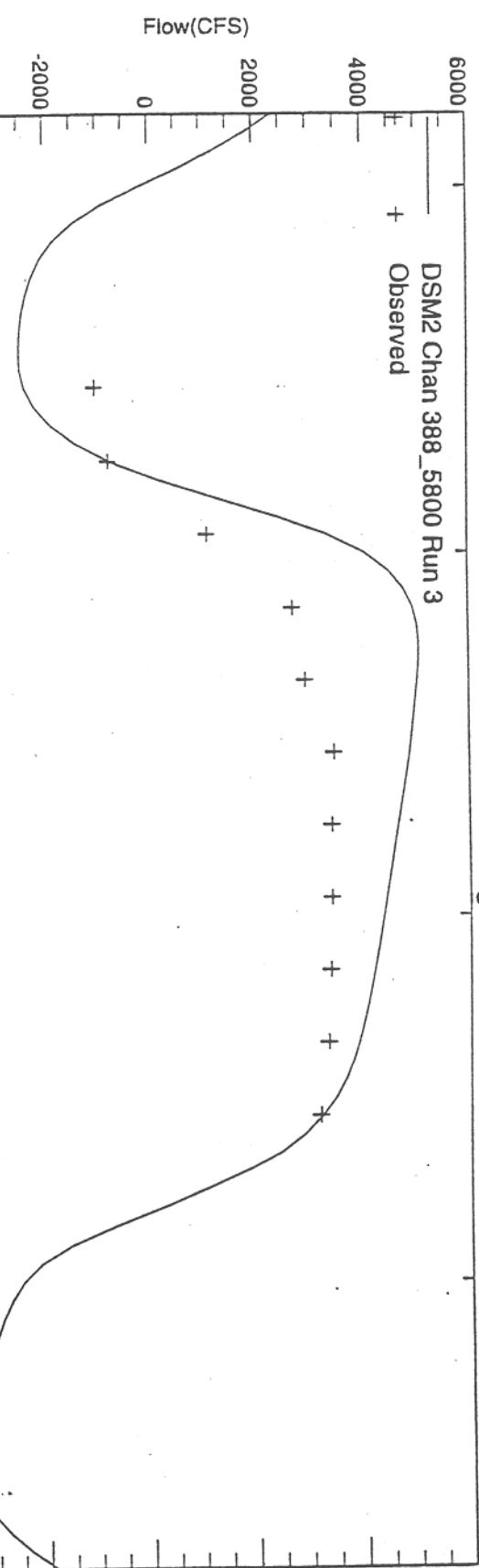


(1 - 2)

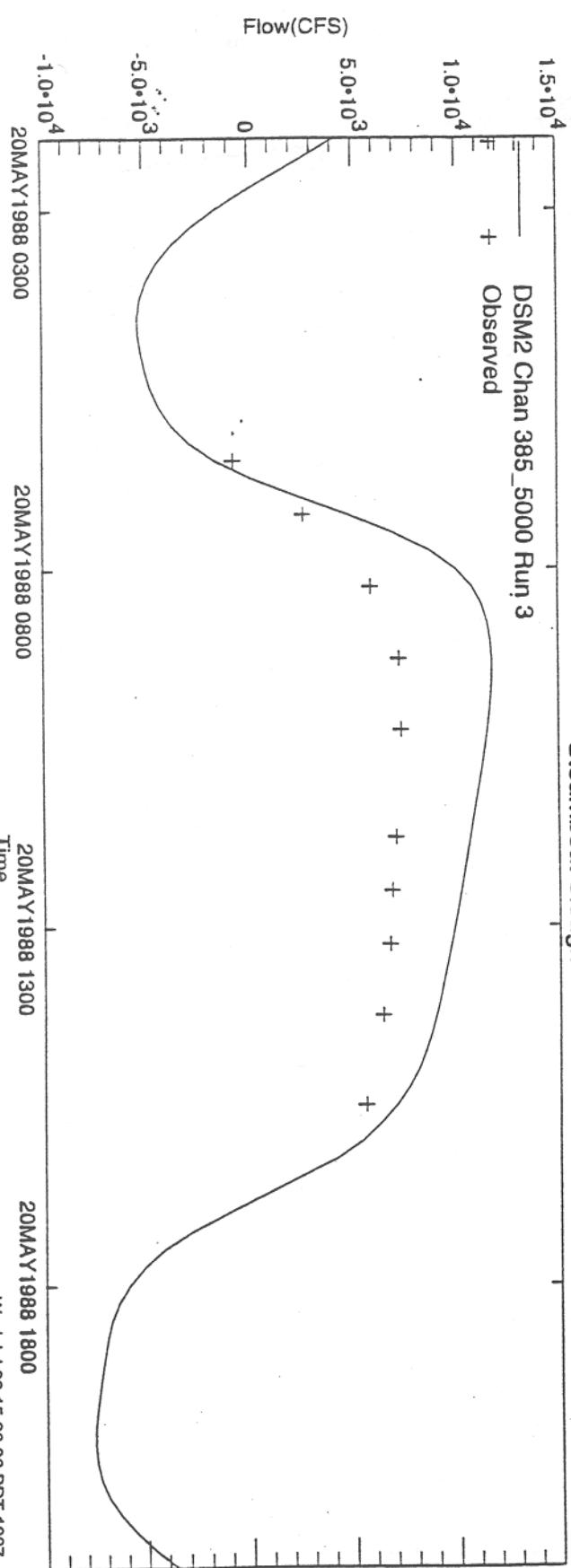
Georgiana Slough near Sacramento R.

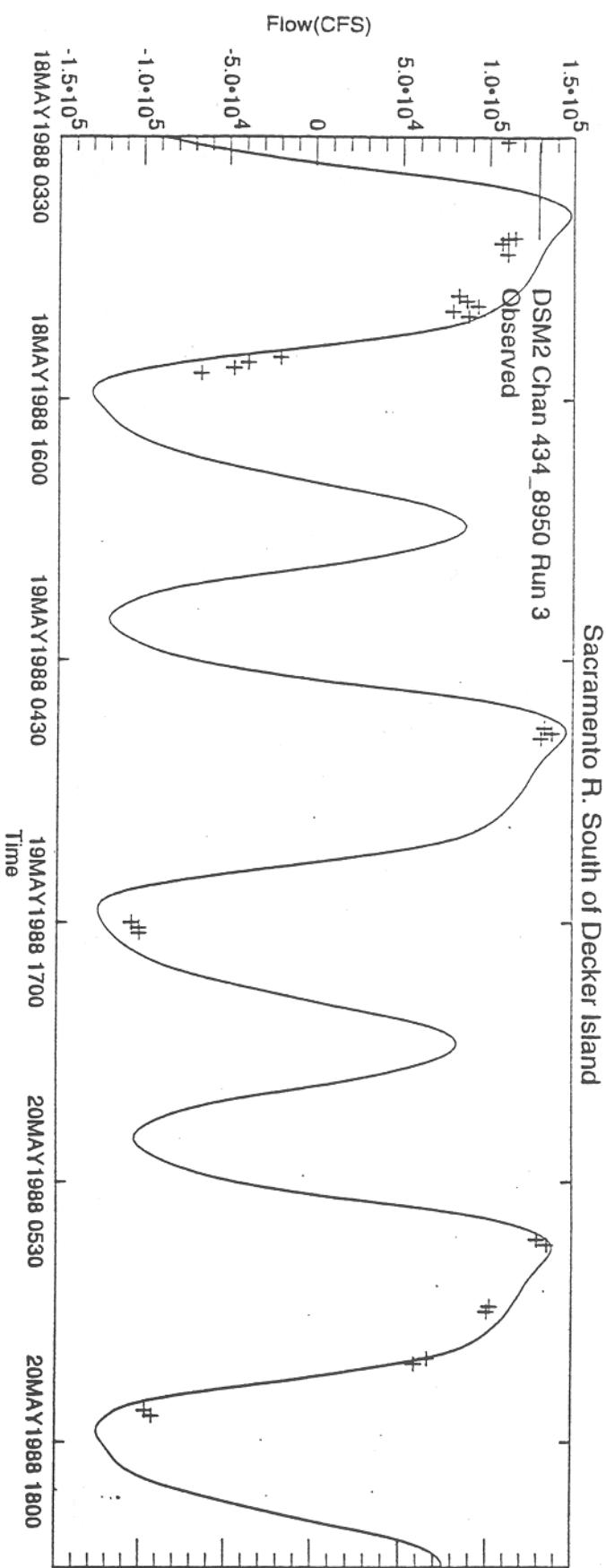


Miner Slough



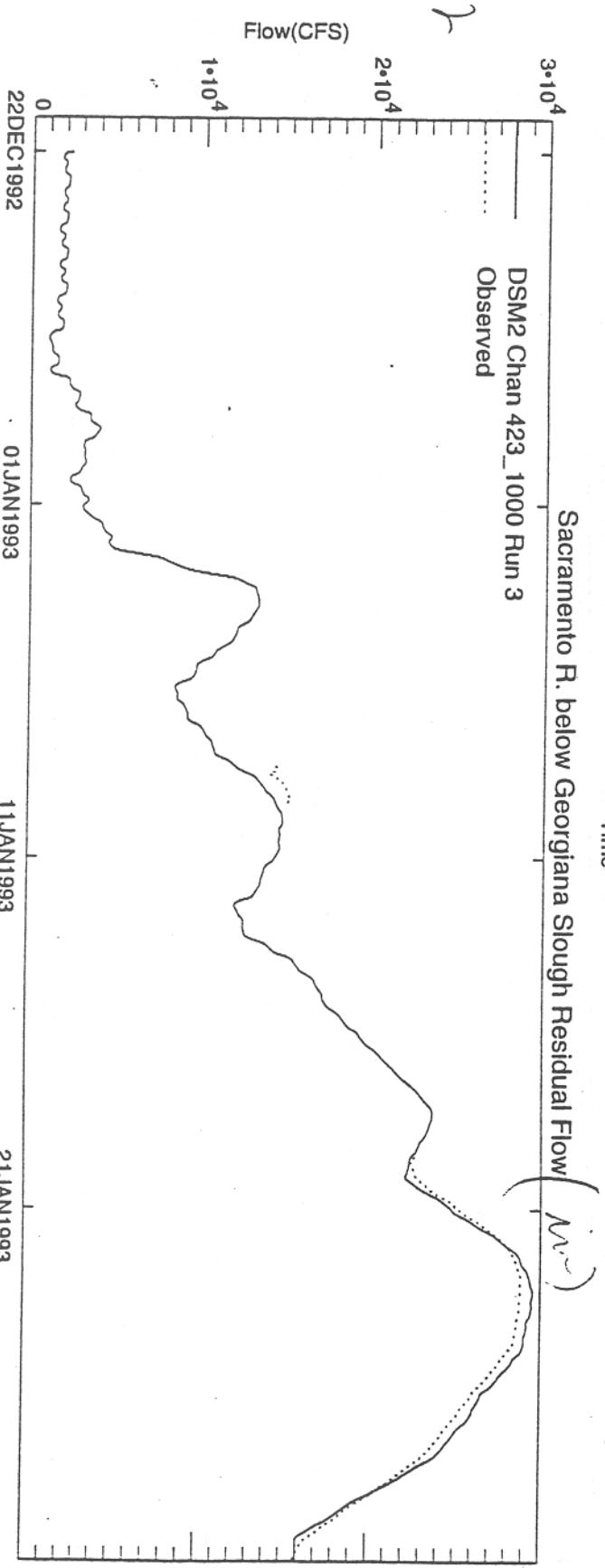
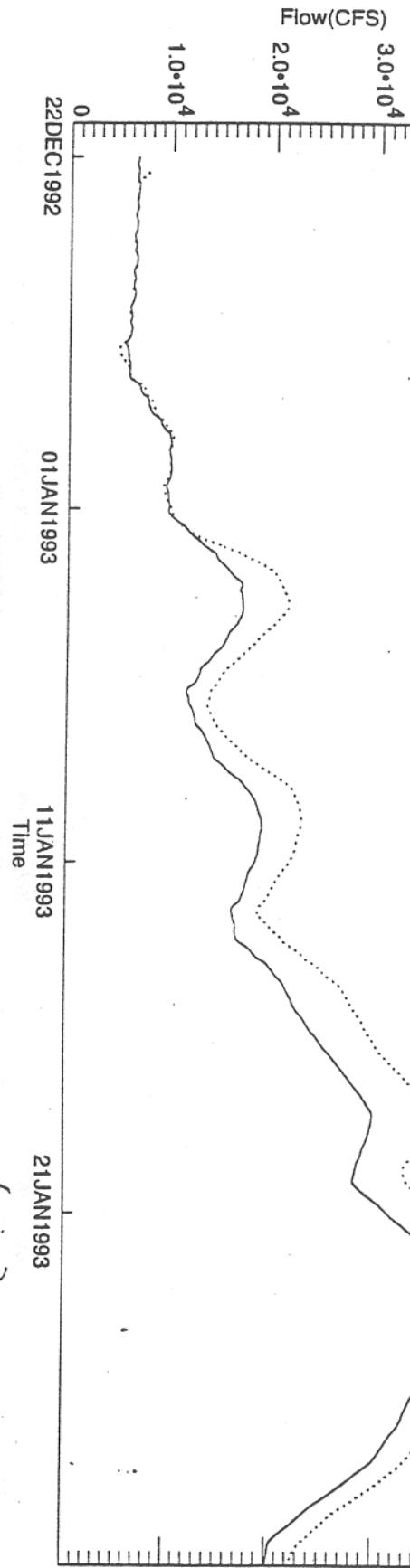
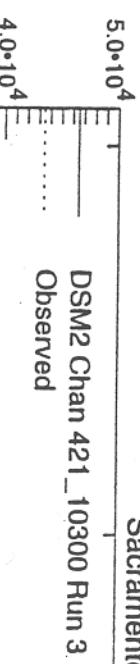
Steamboat Slough



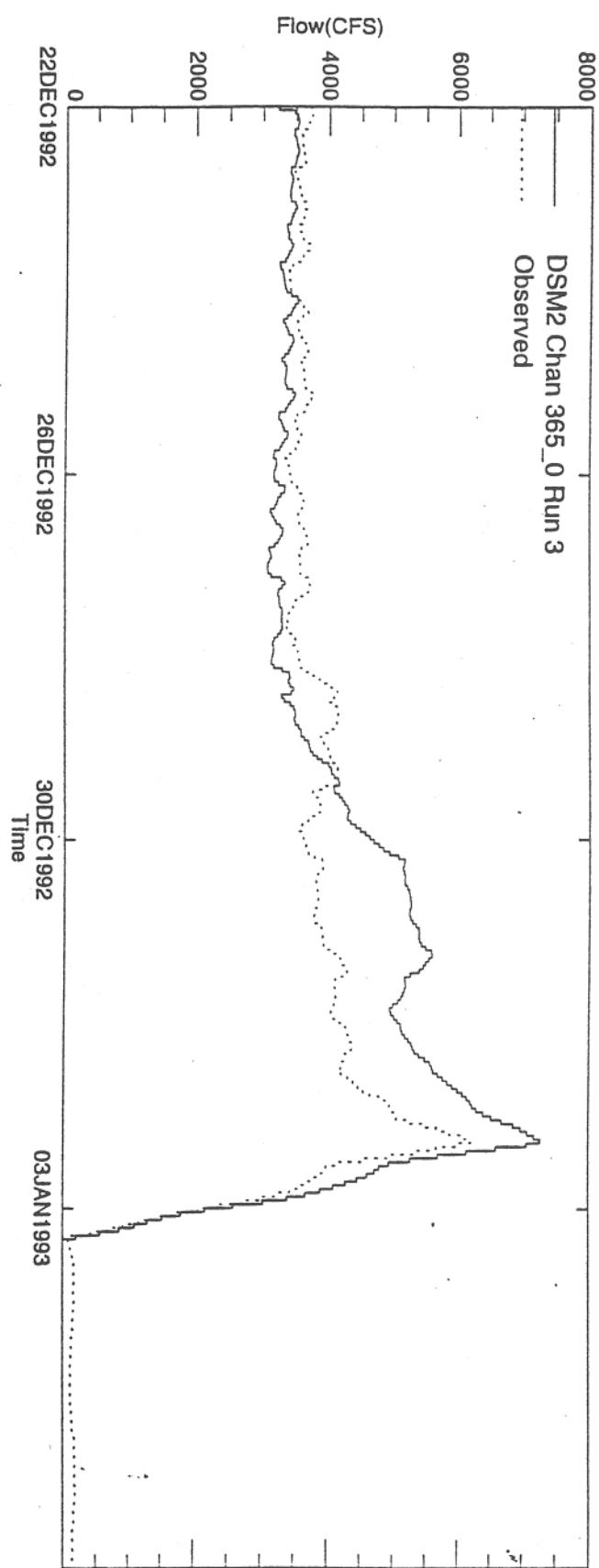


Sacramento R. above Delta Cross-Channel Residual Flow

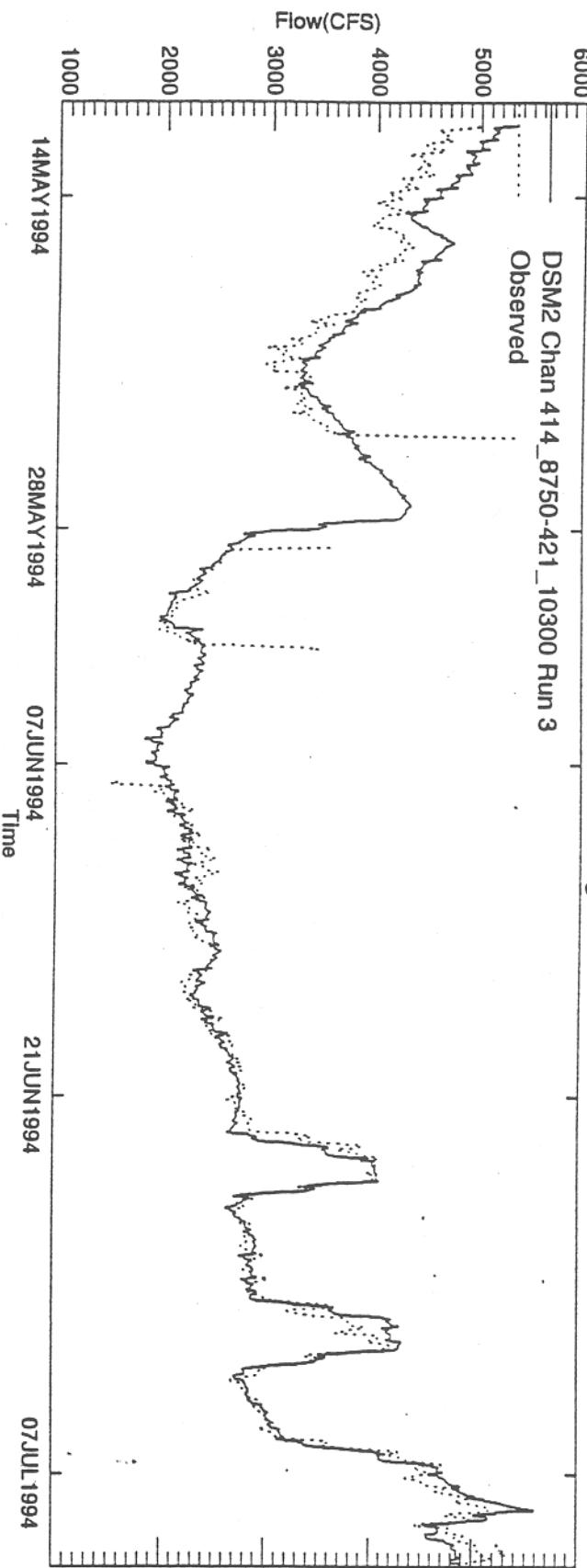
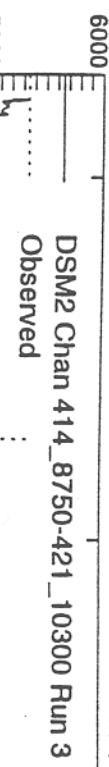
(in)



Delta Cross-Channel Residual Flow



Steamboat + Sutter Slough Residual Flow



$2.0 \cdot 10^4$

Sacramento R. at Freeport

$1.5 \cdot 10^4$

DSM2 Chan 414_8750 Run 3
Observed

$1.0 \cdot 10^4$

Flow(CFS)

$5.0 \cdot 10^3$

Flow(CFS)

0

$-5.0 \cdot 10^3$

$-1.0 \cdot 10^4$

17MAY1994

18MAY1994

19MAY1994

20MAY1994

Time

Sacramento R. at Delta Cross-Channel

$1.5 \cdot 10^4$

DSM2 Chan 421_10300 Run 3
Observed

$1.0 \cdot 10^4$

Flow(CFS)

$5.0 \cdot 10^3$

0

$-5.0 \cdot 10^3$

$-1.0 \cdot 10^4$

17MAY1994

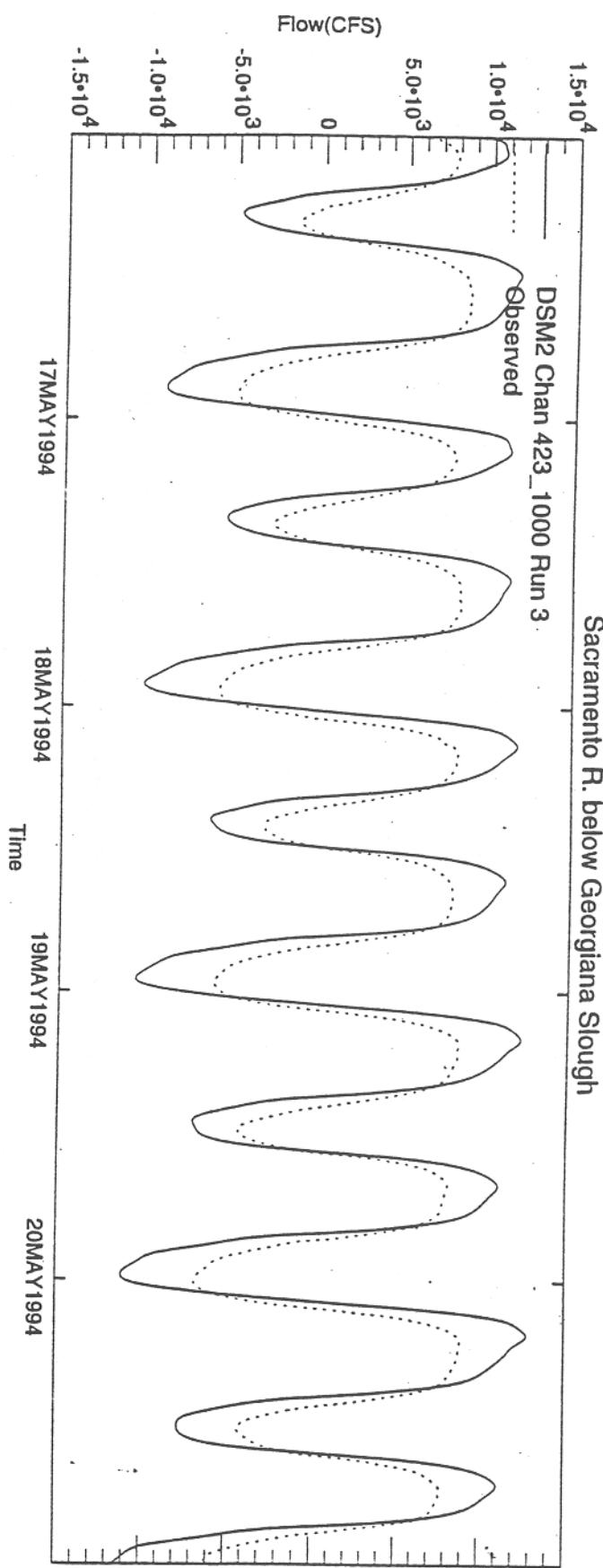
18MAY1994

19MAY1994

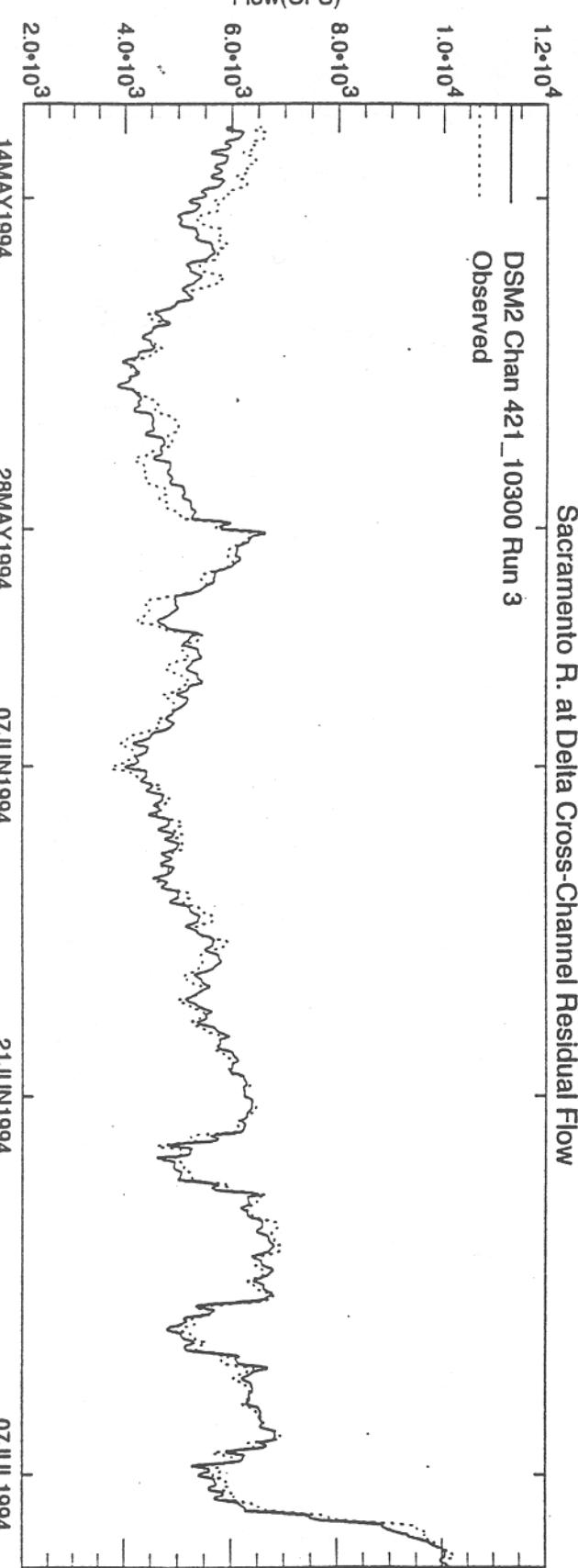
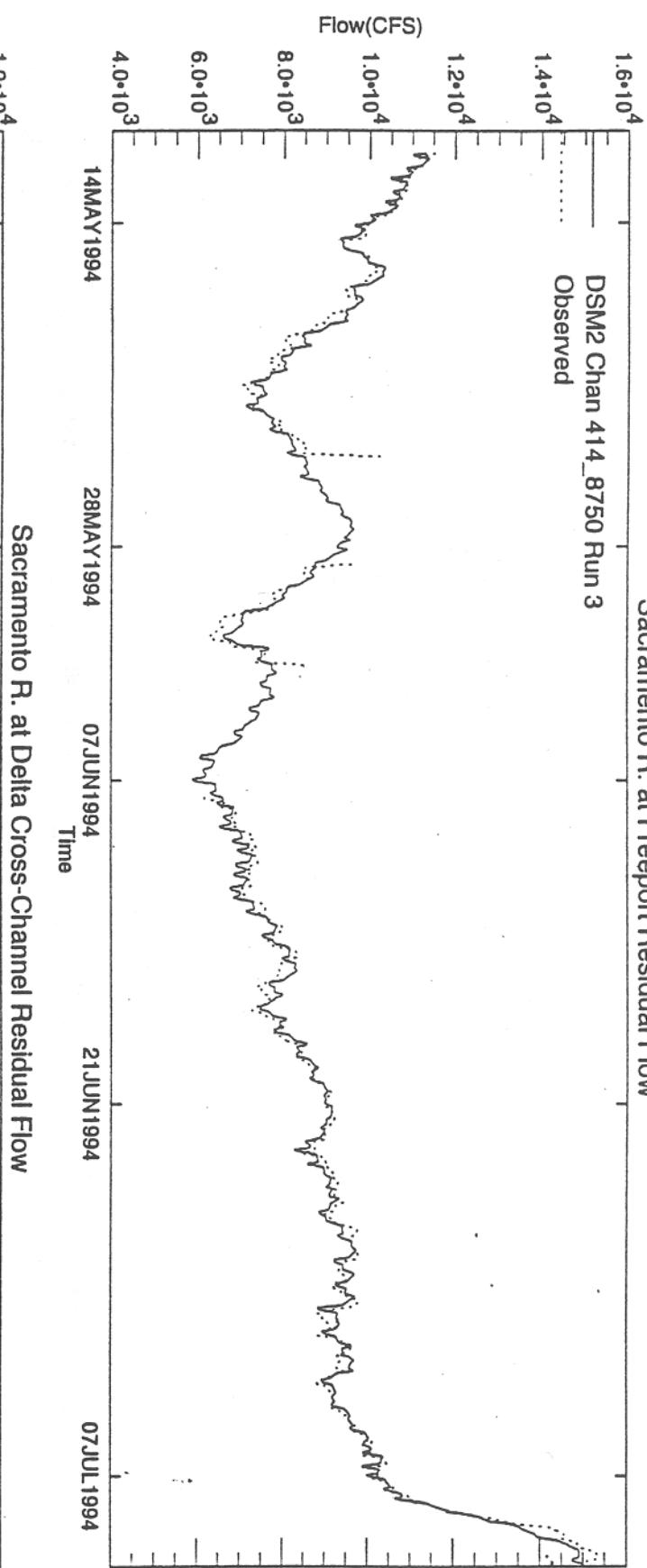
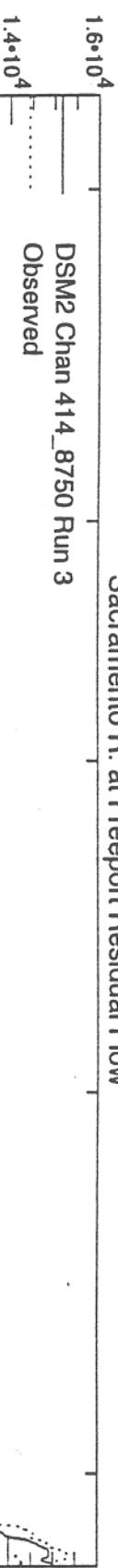
20MAY1994

Time

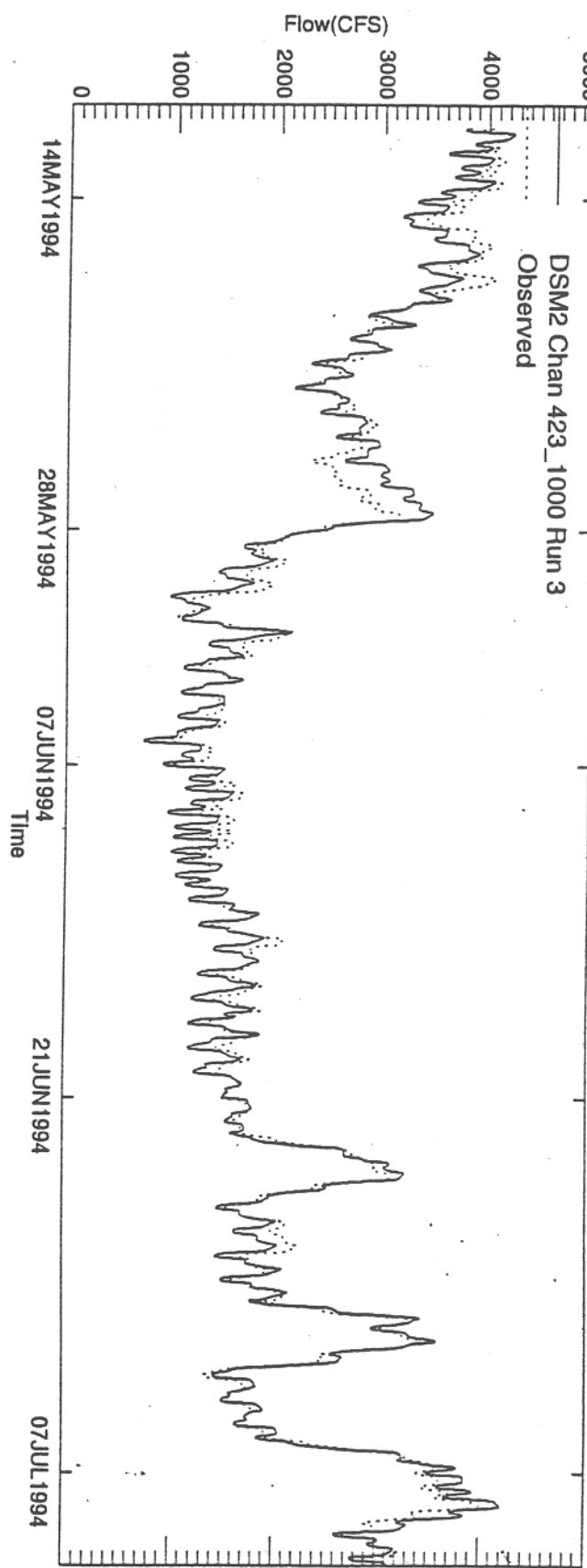
(M)
Figure 9-1
Sacramento R. below Georgiana Slough



Sacramento R. at Freeport Residual Flow



Sacramento R. below Georgiana Slough Residual Flow



$1.5 \cdot 10^4$

Sacramento R. above Delta Cross-Channel

Flow(CFS)

$1.0 \cdot 10^4$

DSM2 Chan 421_10300 Run 3
Observed

$5.0 \cdot 10^3$
 0

- $5.0 \cdot 10^3$
01OCT1994 02OCT1994 03OCT1994 04OCT1994 05OCT1994 06OCT1994

Time

$1.5 \cdot 10^4$

Sacramento R. below Georgiana Slough

$1.0 \cdot 10^4$

DSM2 Chan 423_1000 Run 3
Observed

$5.0 \cdot 10^3$

0

Flow(CFS)

$-1.0 \cdot 10^4$

$-5.0 \cdot 10^3$

$-1.5 \cdot 10^4$

01OCT1994

02OCT1994

03OCT1994

04OCT1994

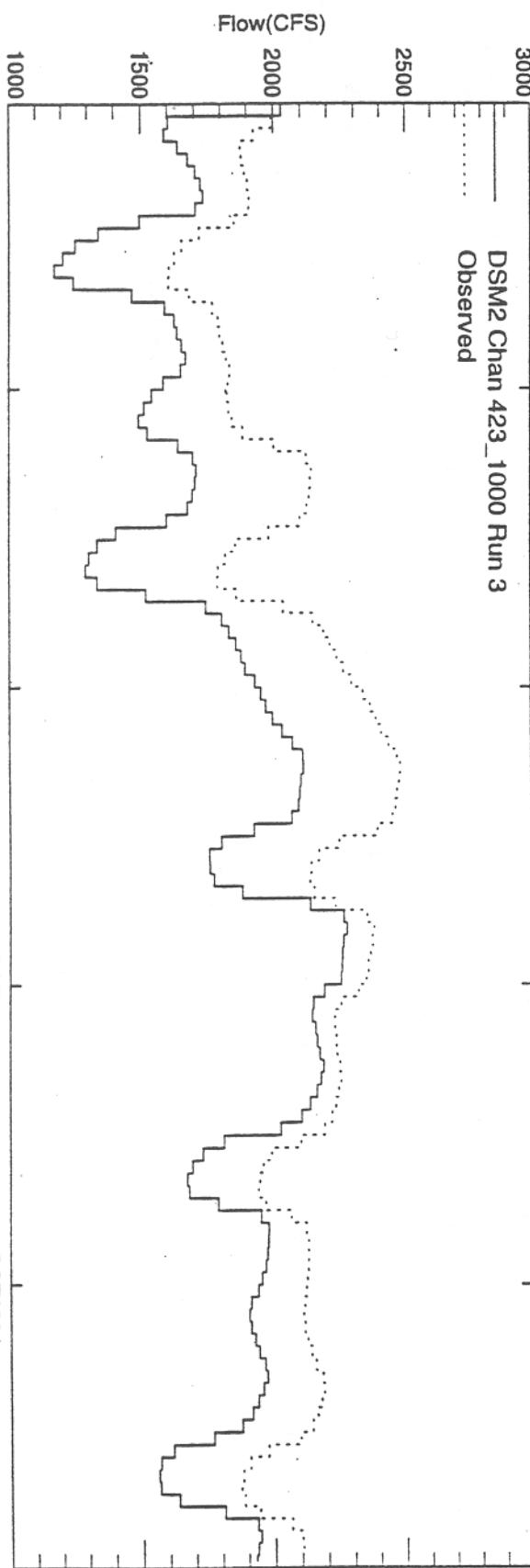
05OCT1994

06OCT1994

Sacramento R. above Delta Cross-Channel Residual Flow



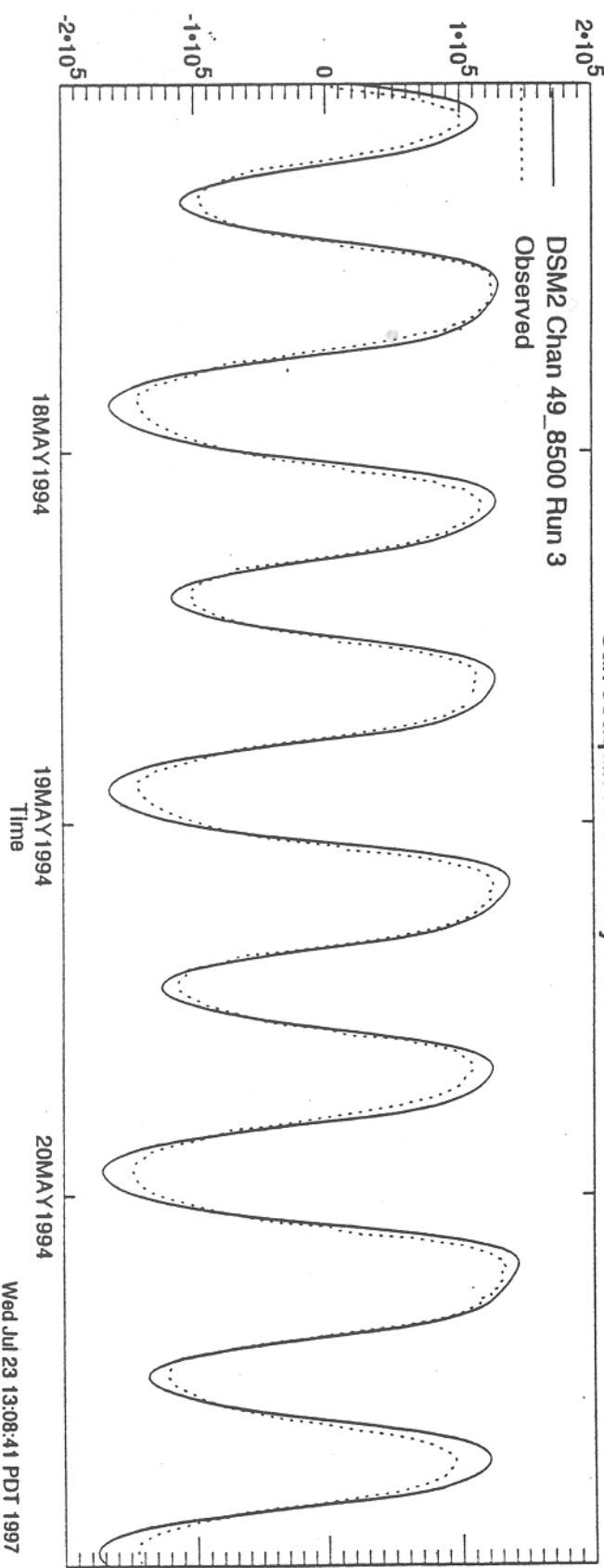
Sacramento R. below Georgiana Slough Residual Flow



Three Mile Slough



San Joaquin R. at Jersey Point



Three Mile Slough Residual Flow

DSM2 Chan 310_400 Run 3
..... Observed

Flow(CFS)

2000
-2000
0

-4000

-6000
14MAY1994
28MAY1994
07JUN1994
21JUN1994
07JUL1994
21JUN1994
07JUL1994

Time

San Joaquin R. at Jersey Point Residual Flow

DSM2 Chan 49_8500 Run 3
..... Observed

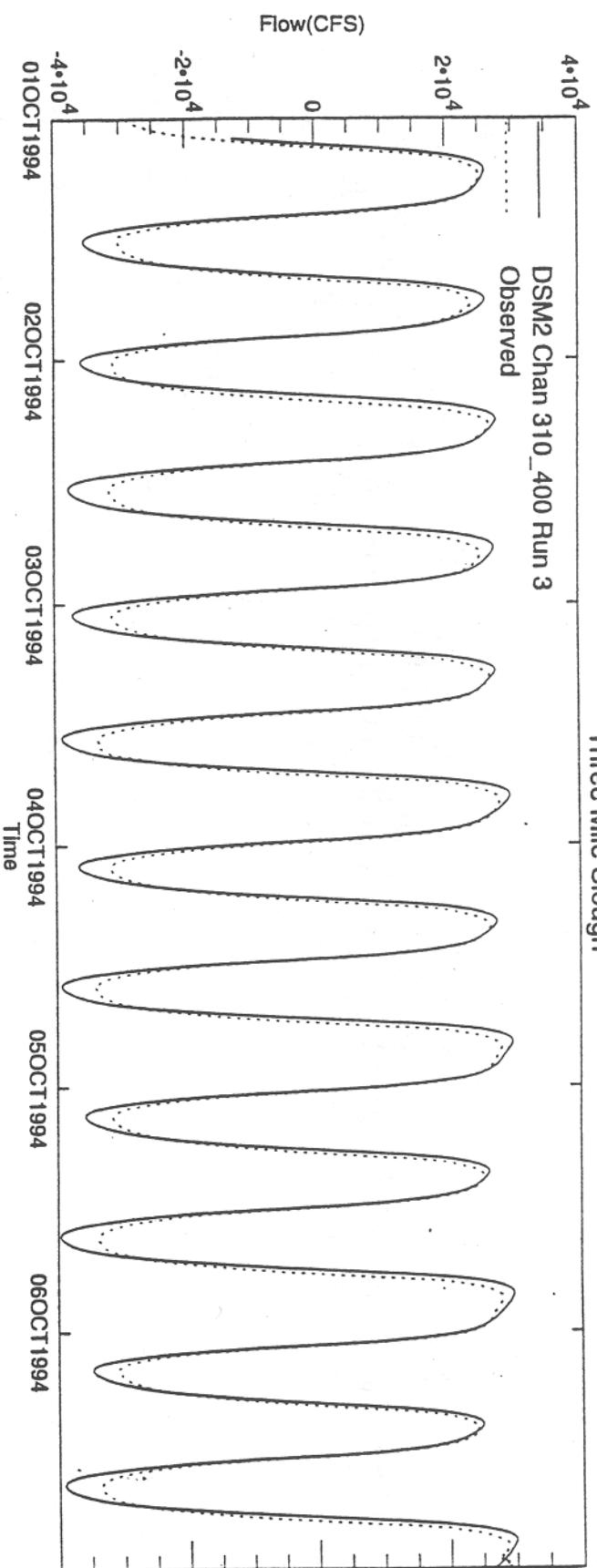
Flow(CFS)

5.0•10³
0
-5.0•10³
-1.0•10⁴
-1.5•10⁴

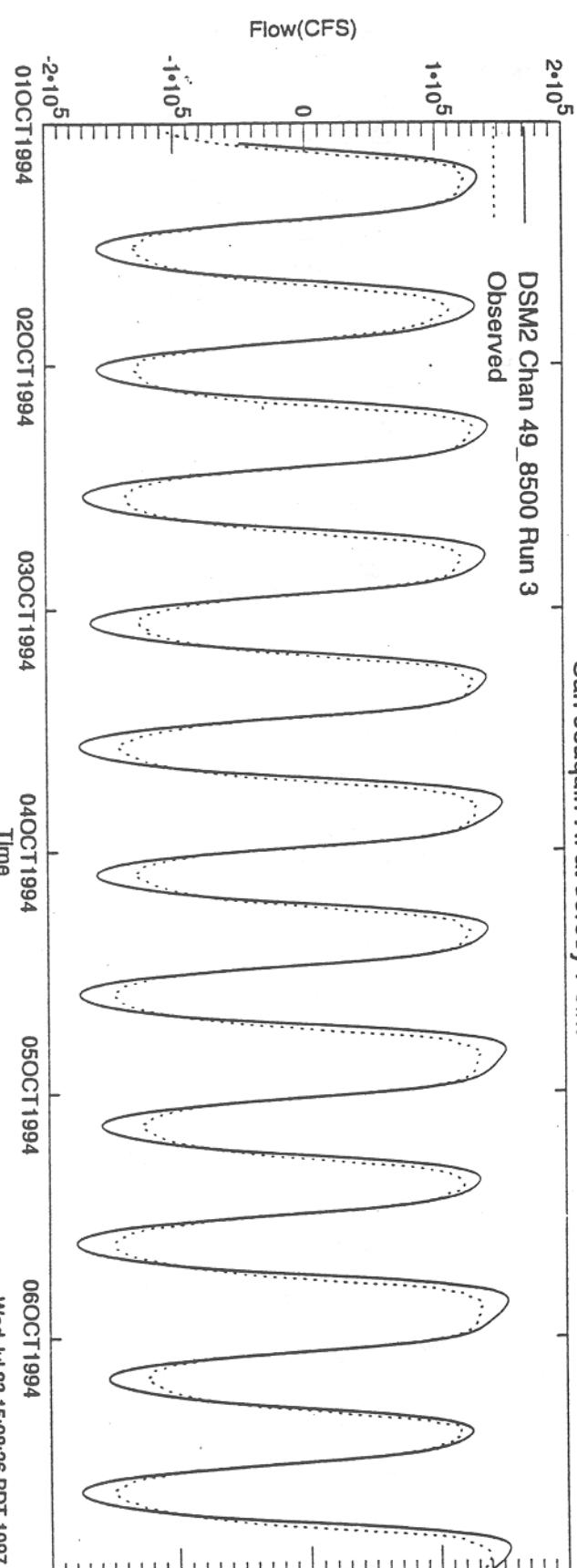
14MAY1994
28MAY1994
07JUN1994
21JUN1994
07JUL1994
21JUN1994
07JUL1994

Time

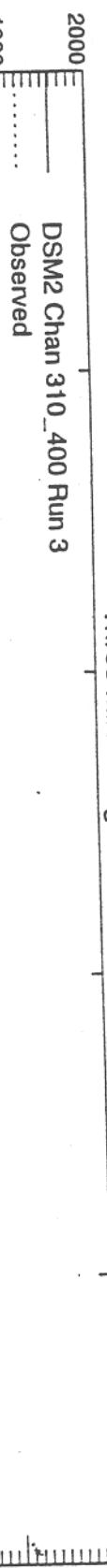
Three Mile Slough



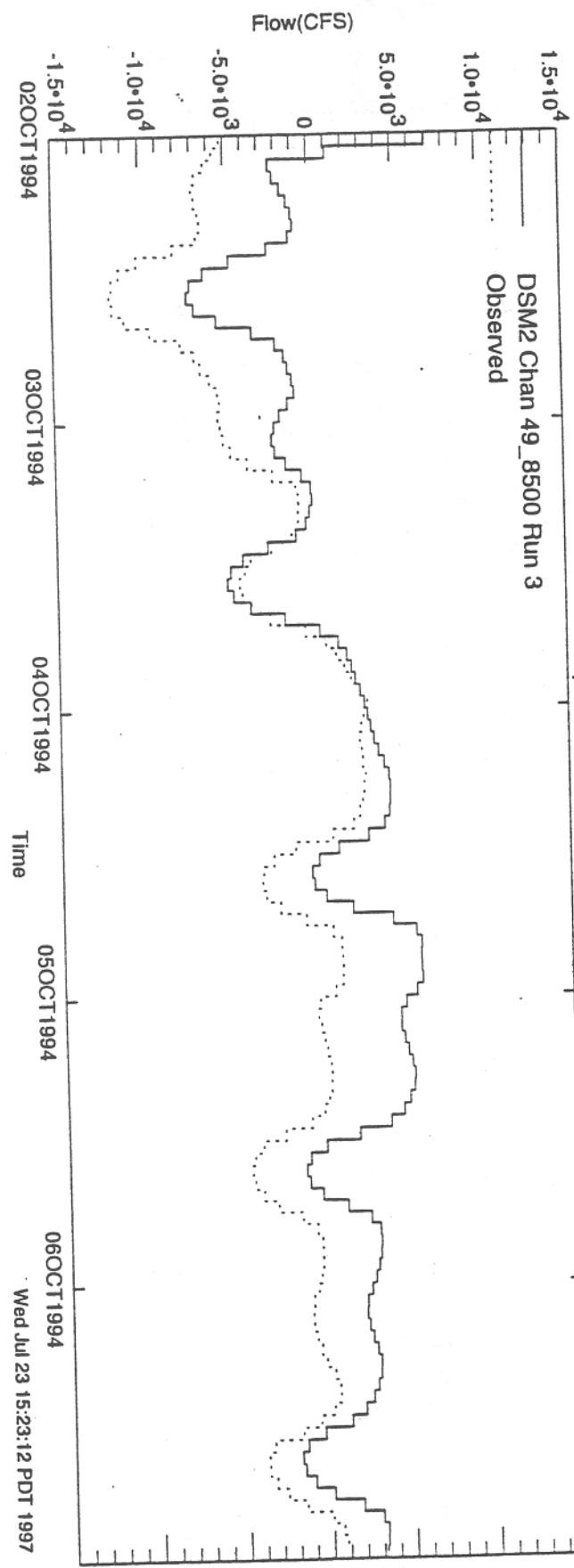
San Joaquin R. at Jersey Point



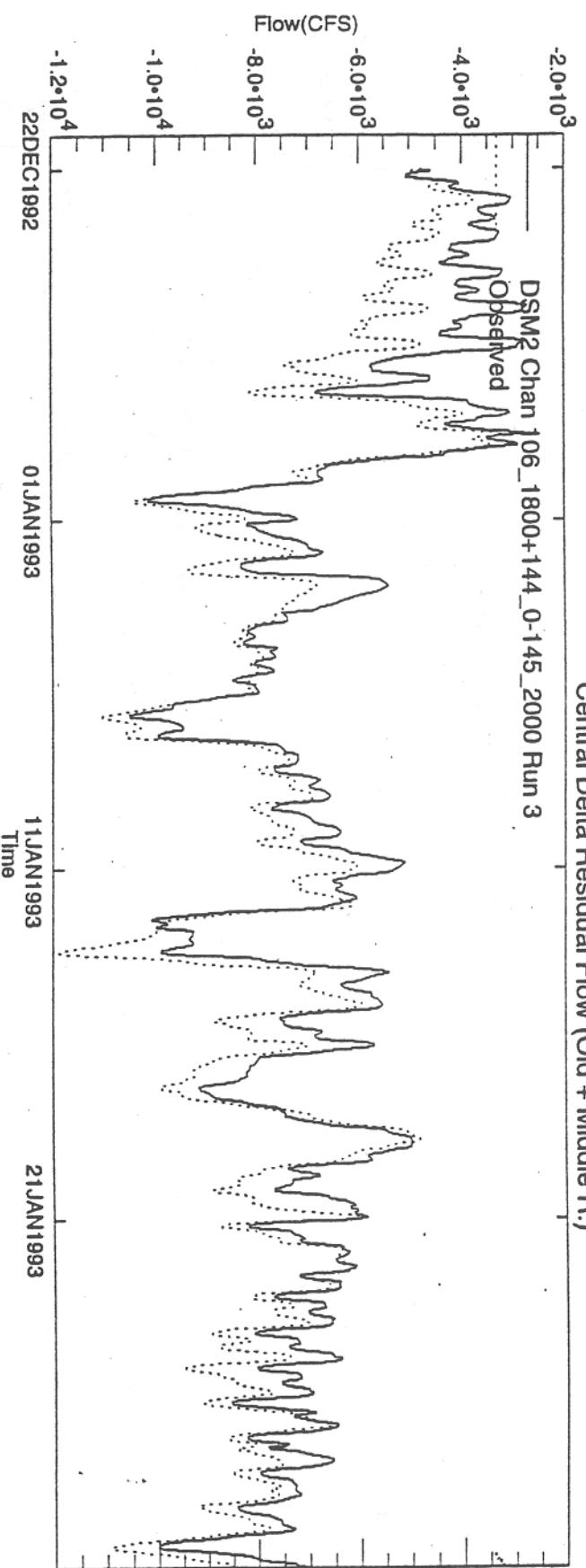
Three Mile Slough Residual Flow

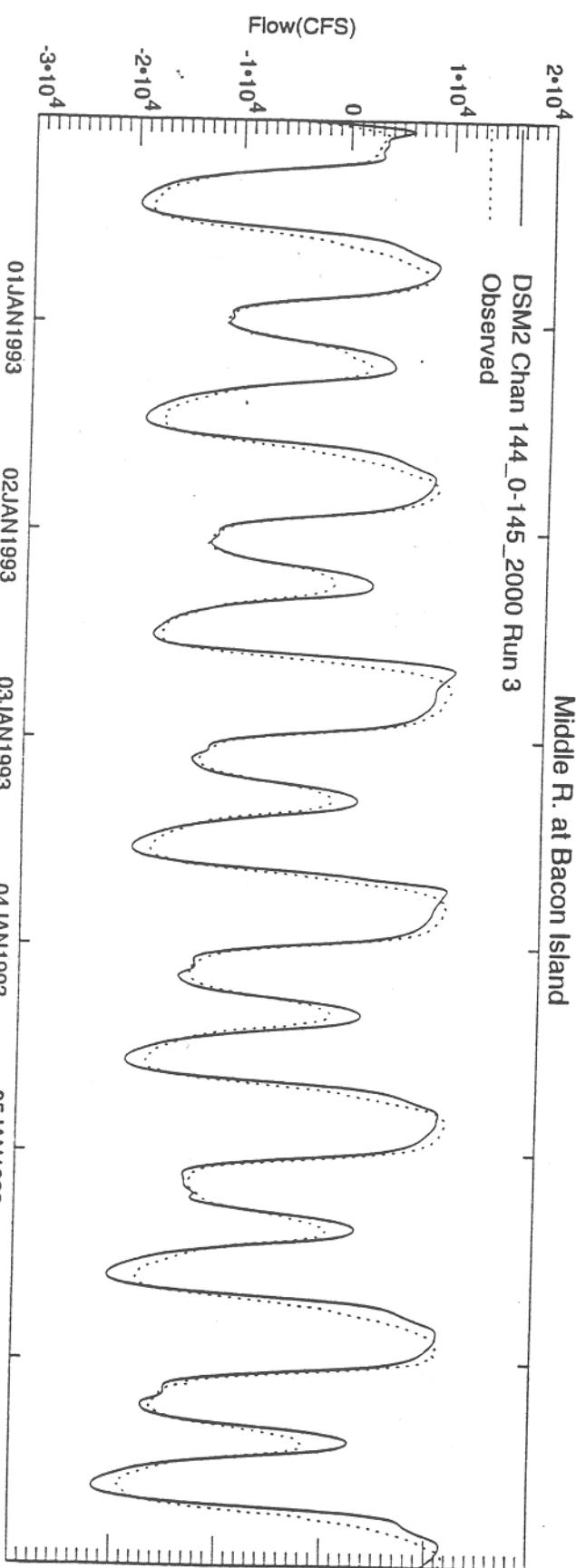
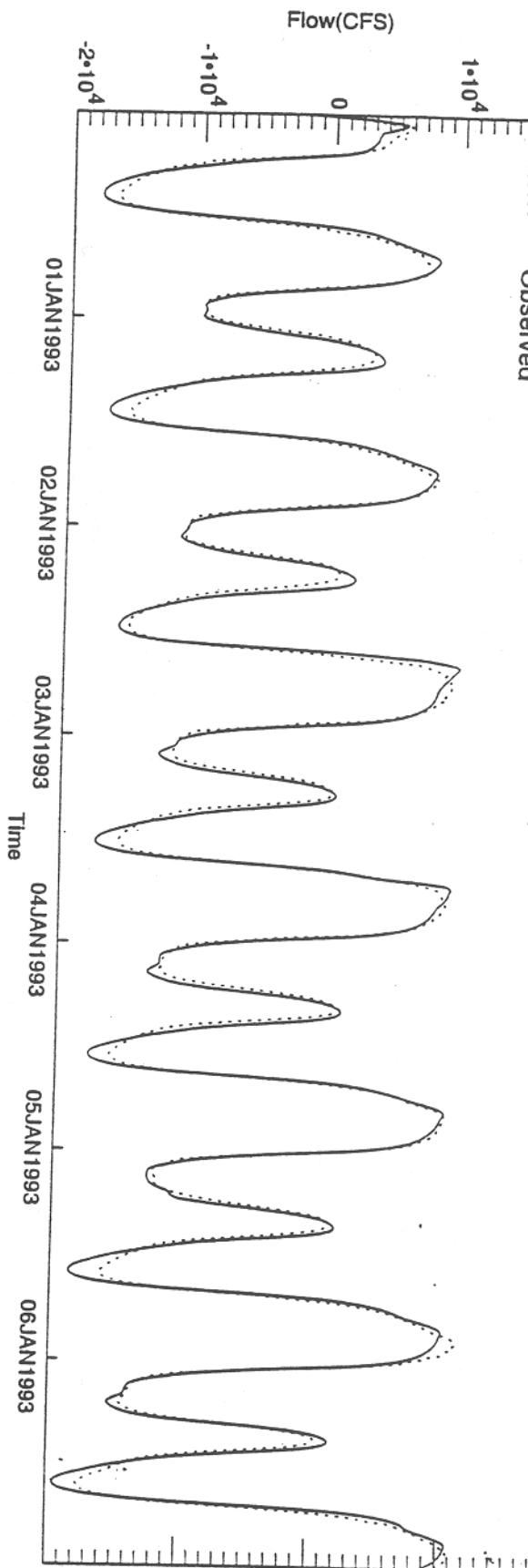


San Joaquin R. at Jersey Point Residual Flow

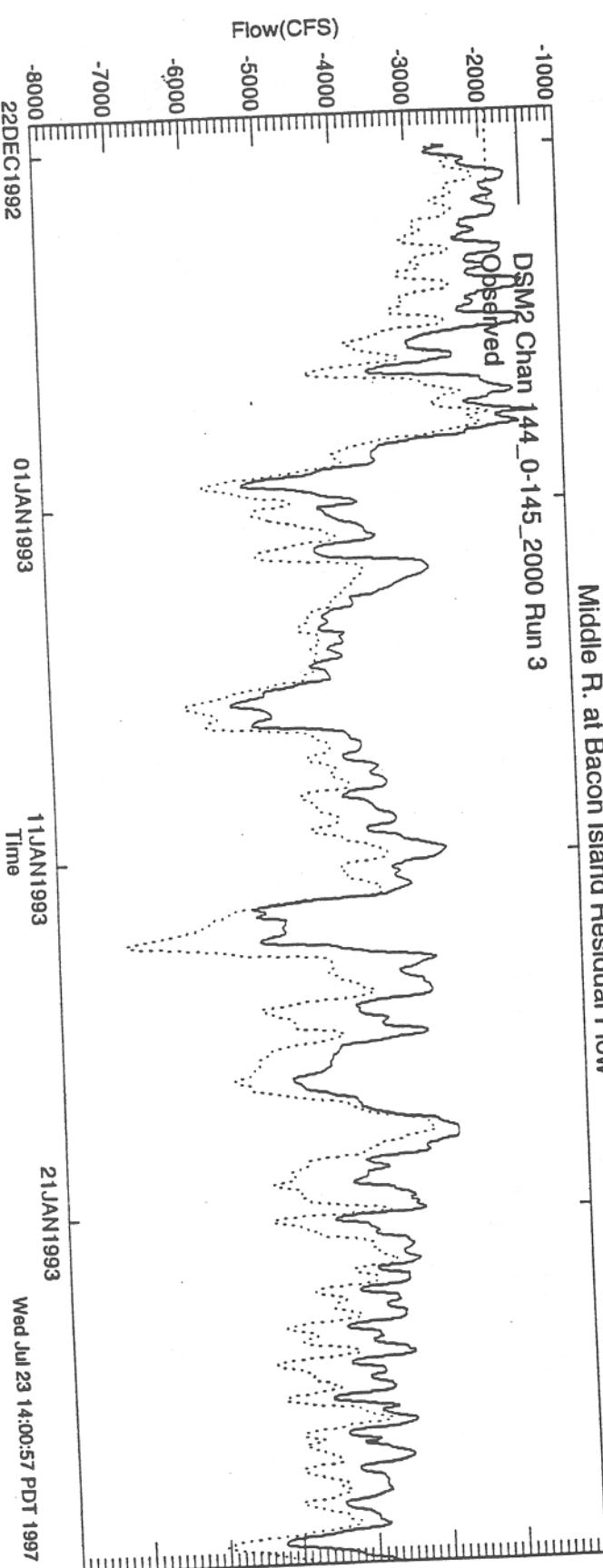
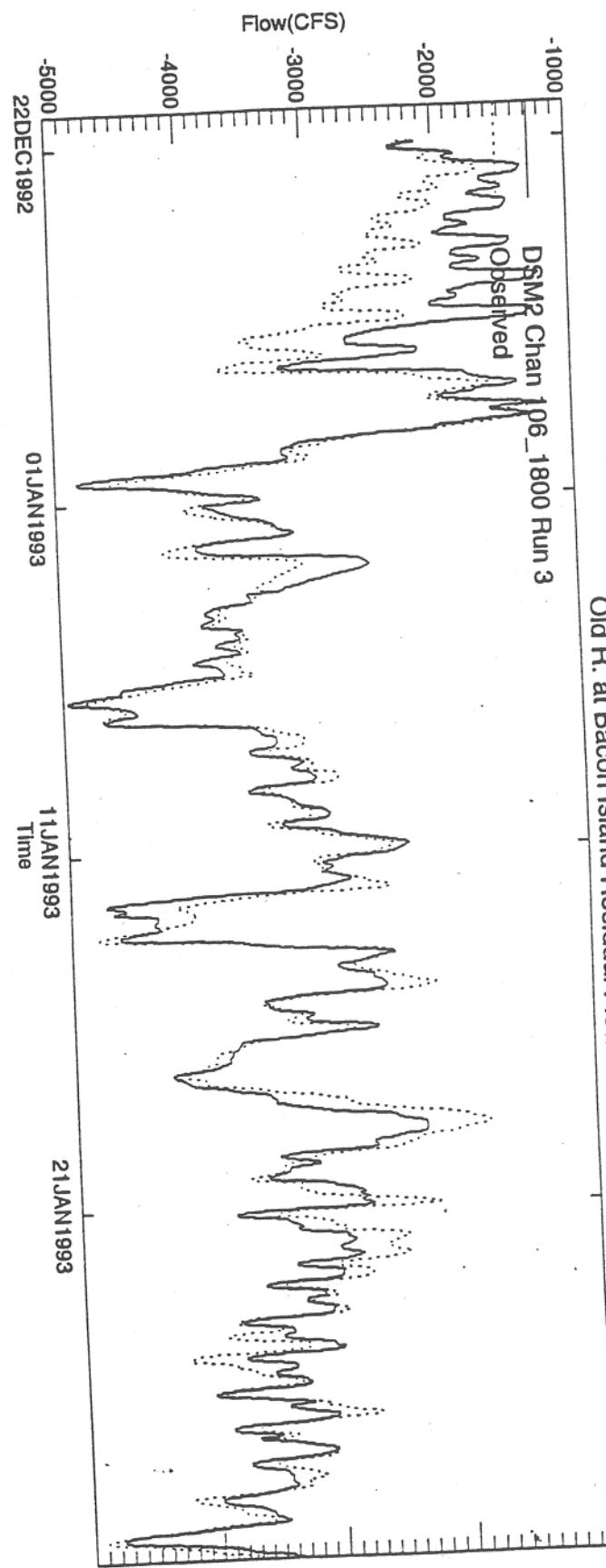


Central Delta Residual Flow (Old + Middle R.)

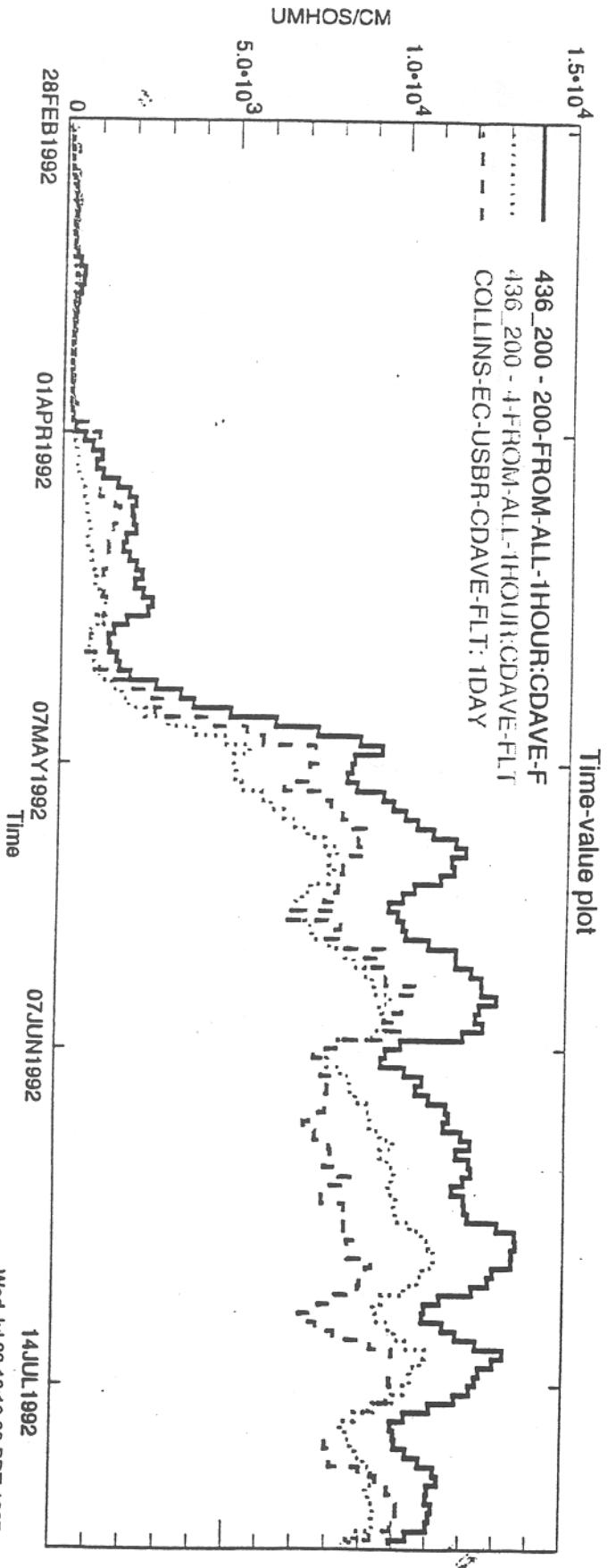
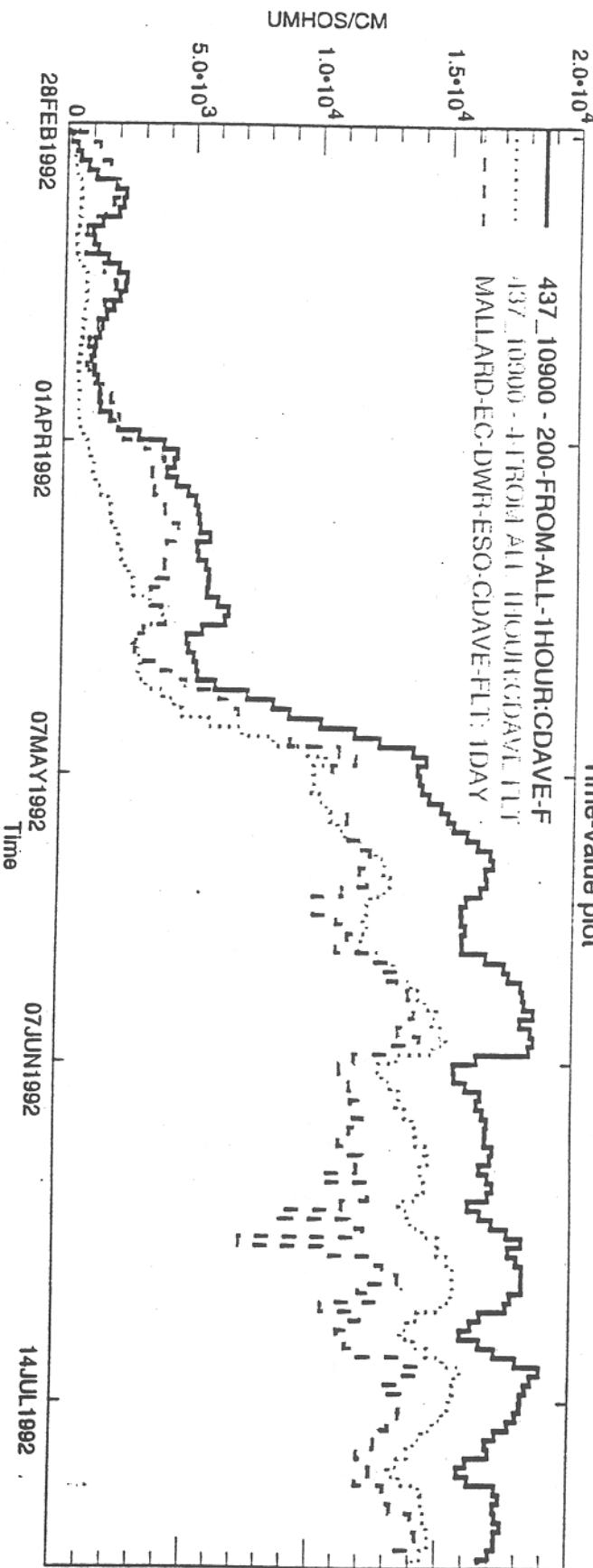




Old R. at Beacon Island Residual Flow



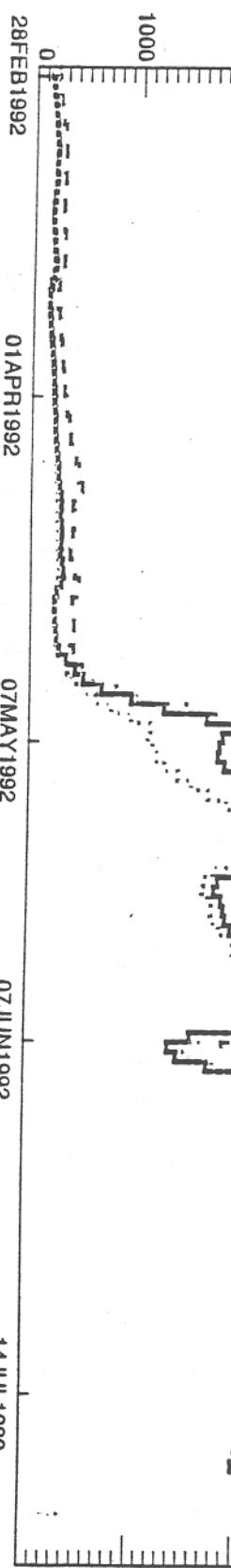
Time-value plot



Time-value plot

434_200 - 200-FROM-ALL-1HOUR:CDAVE-F
 434_200 - 4 FROM ALL 1HOUR:CDAVE-FLT
 EMMATON-EC-USBR-CDAVE-FLT; 1DAY

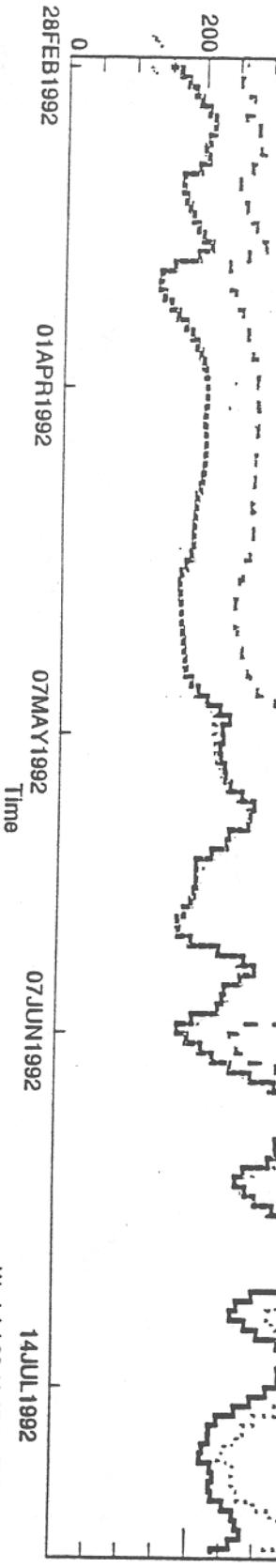
UMHOS/CM
 3000
 2000
 1000



Time-value plot

430_7600 - 200-FROM-ALL-1HOUR:CDAVE-F
 430_7600 - 4 FROM ALL 1HOUR:CDAVE-FLT
 RIOVISTA-EC-USBR-CDAVE-FLT; 1DAY

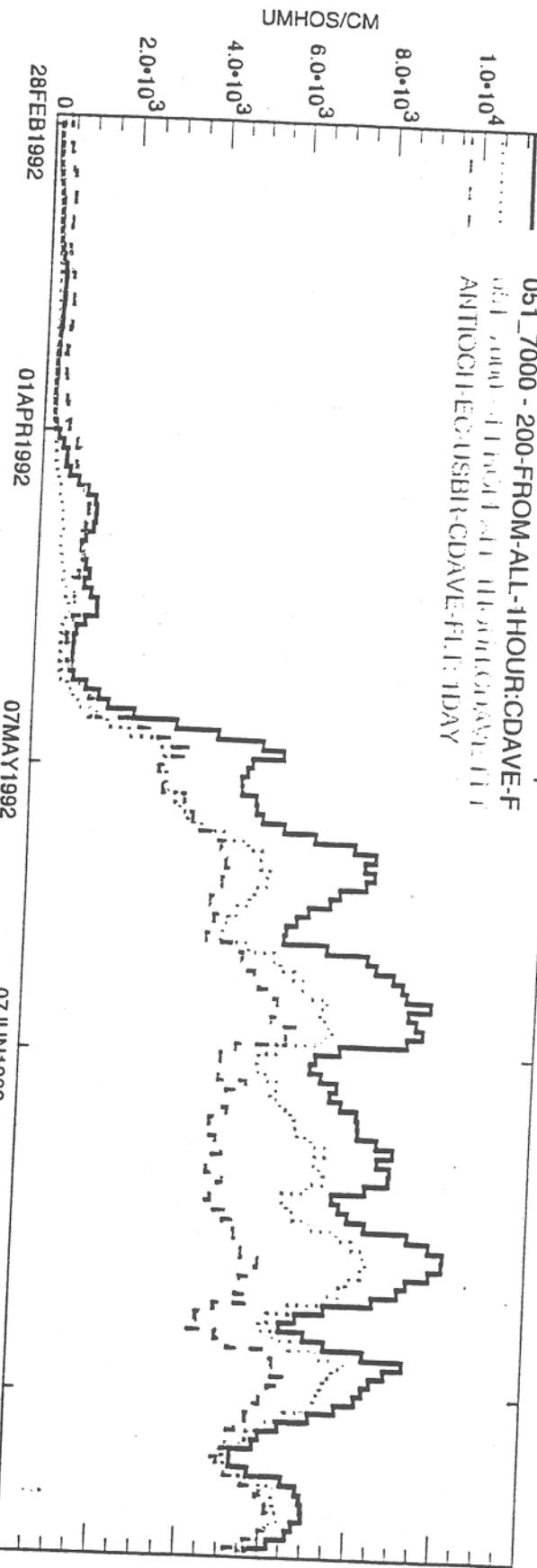
UMHOS/CM
 400
 200
 0



Time-value plot

051_7000 - 200-FROM-ALL-1HOUR:CDAVE-F
 1.0•10⁴
 8.0•10³
 6.0•10³
 4.0•10³
 2.0•10³
 0

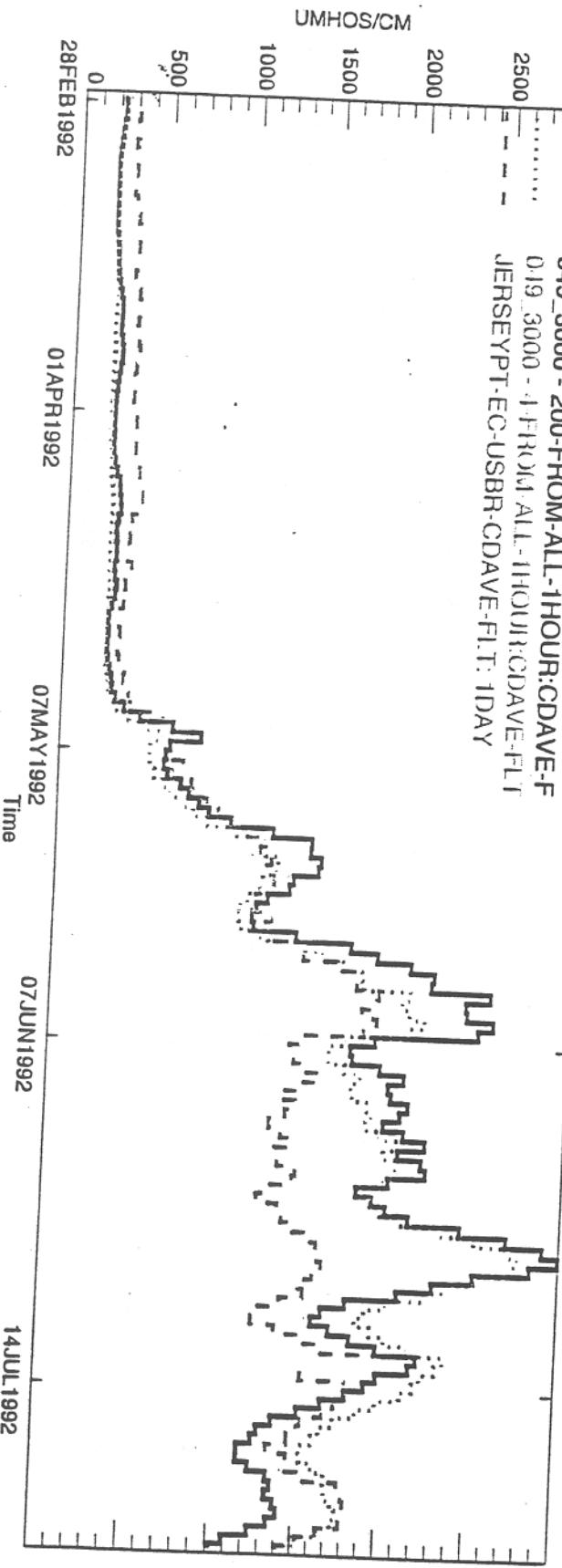
ANTIOCH-EC-USBR-CDAVE-FLT: 1DAY



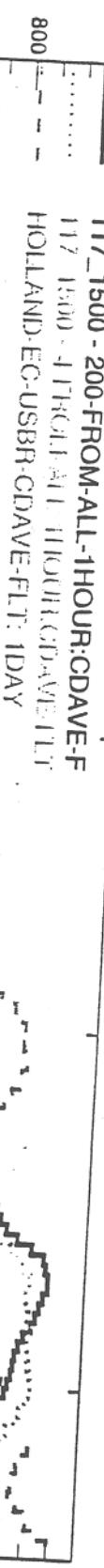
Time-value plot

3000
 2500
 2000
 1500
 1000
 500
 0

049_3000 - 200-FROM-ALL-1HOUR:CDAVE-F
 019_3000 - 1-FROM-ALL-1HOUR:CDAVE-FLT
 JERSEYPT-EC-USBR-CDAVE-FLT: 1DAY

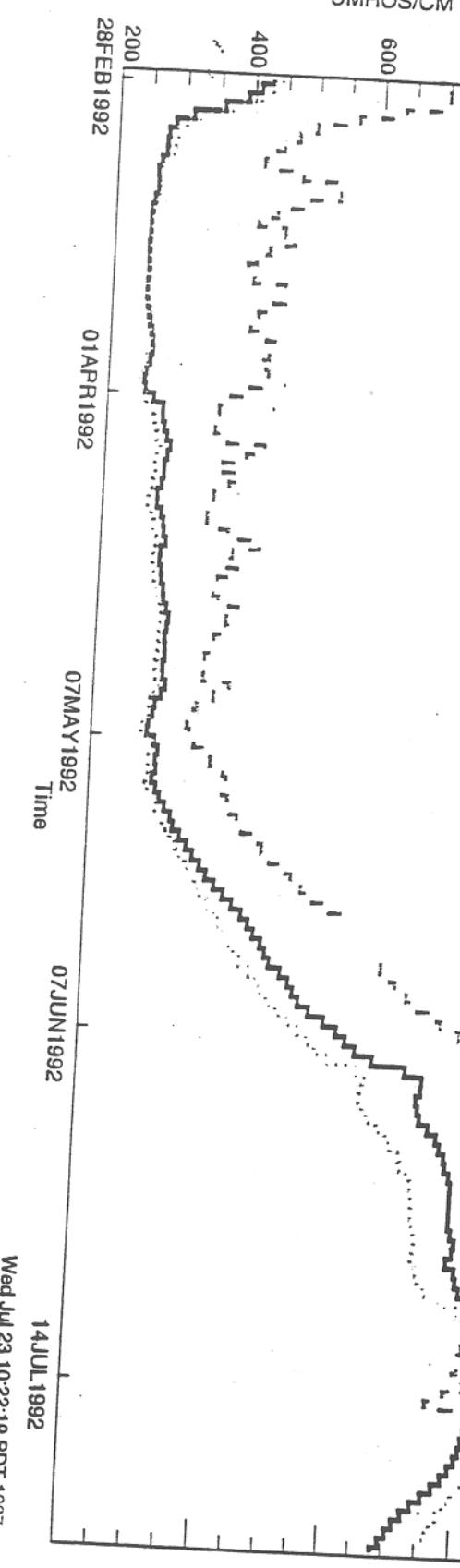


Time-value plot

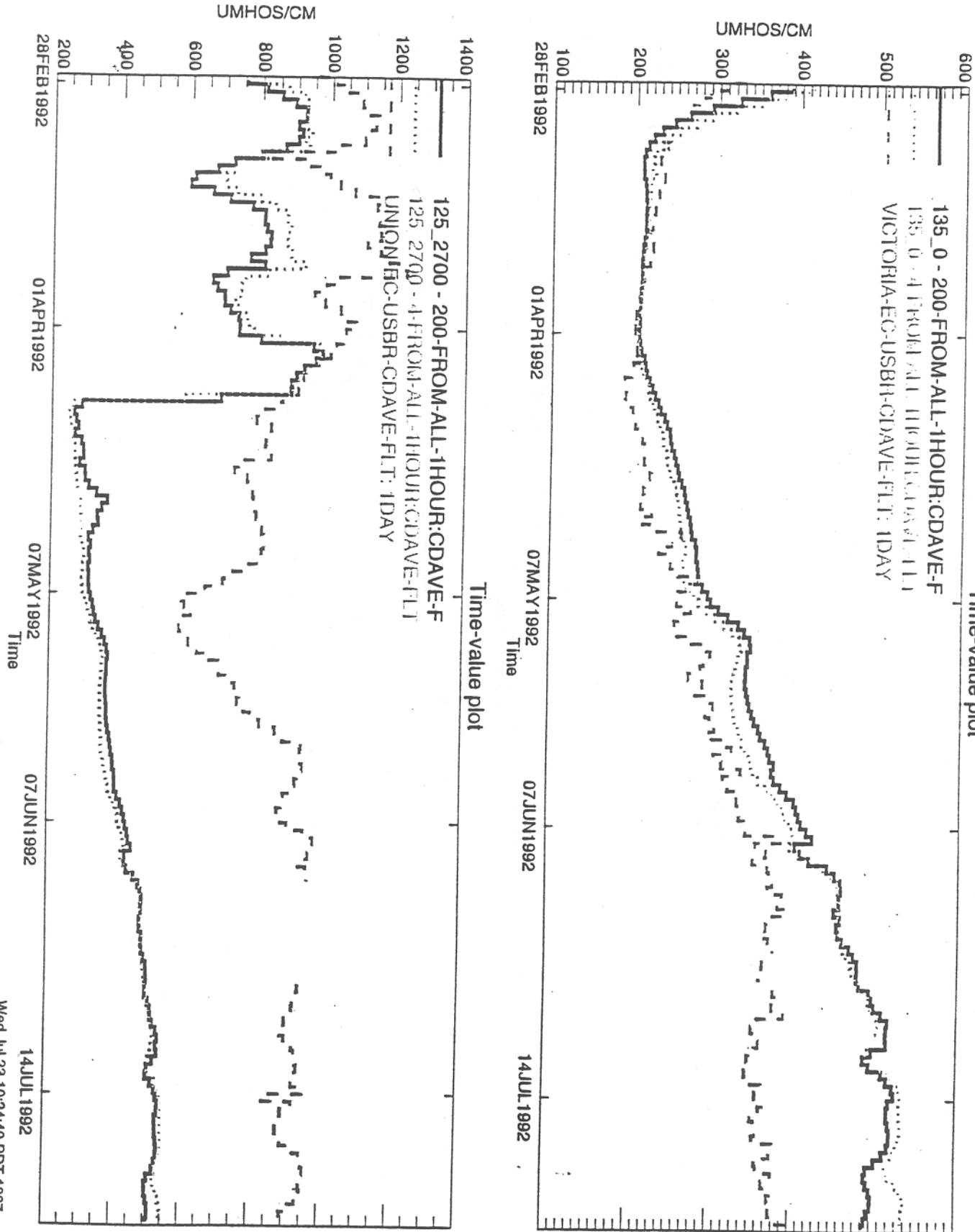


9-38

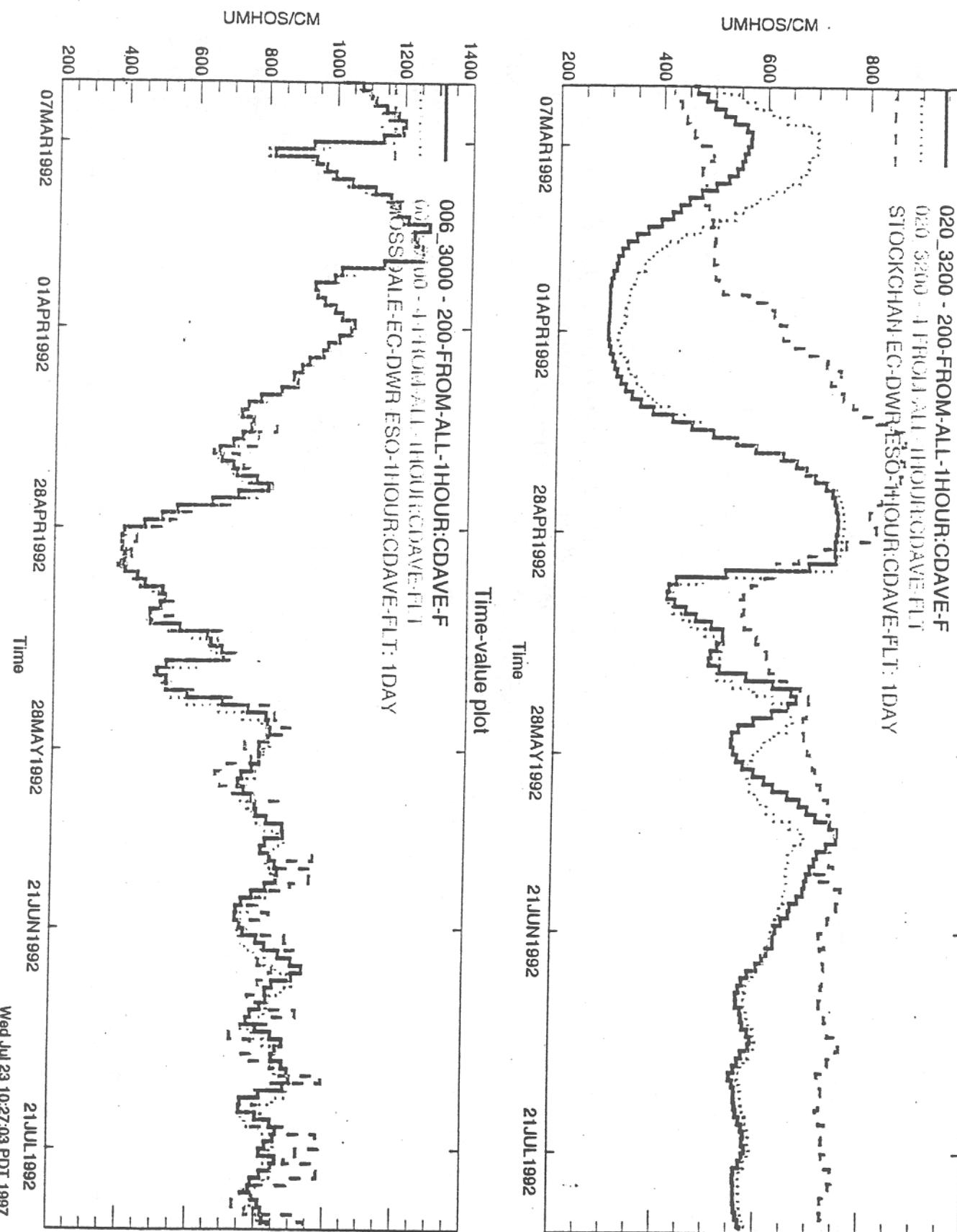
Time-value plot



Time-value plot

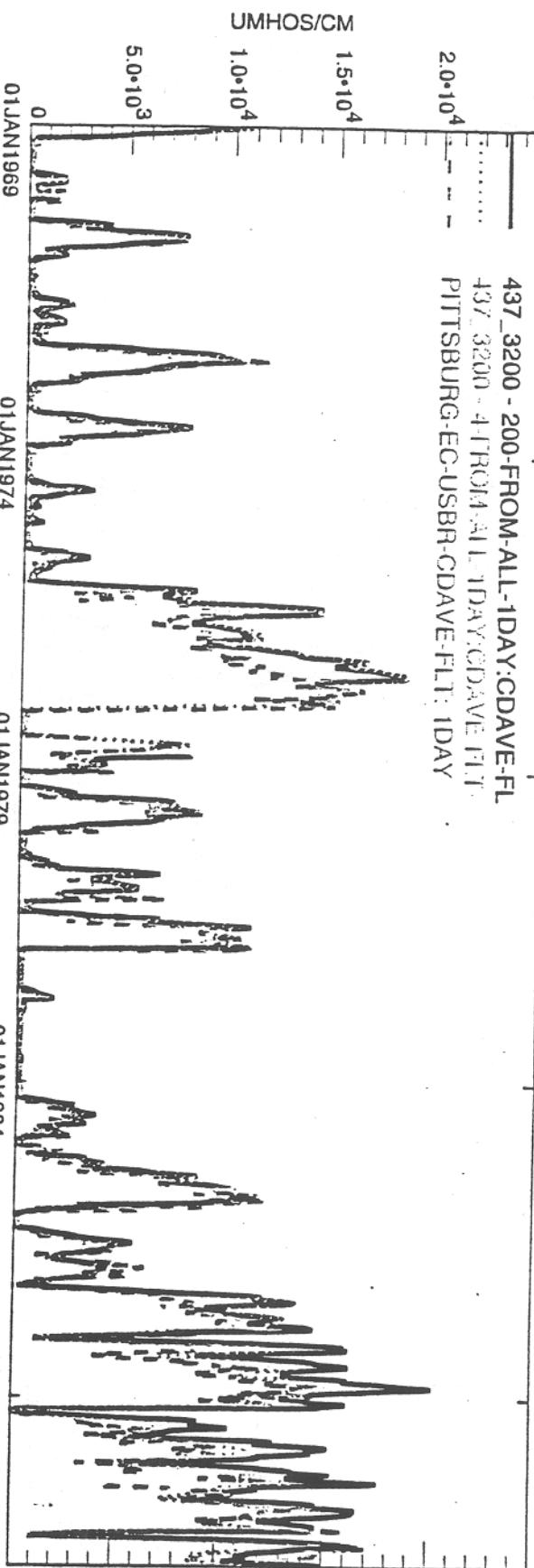


Time-value plot

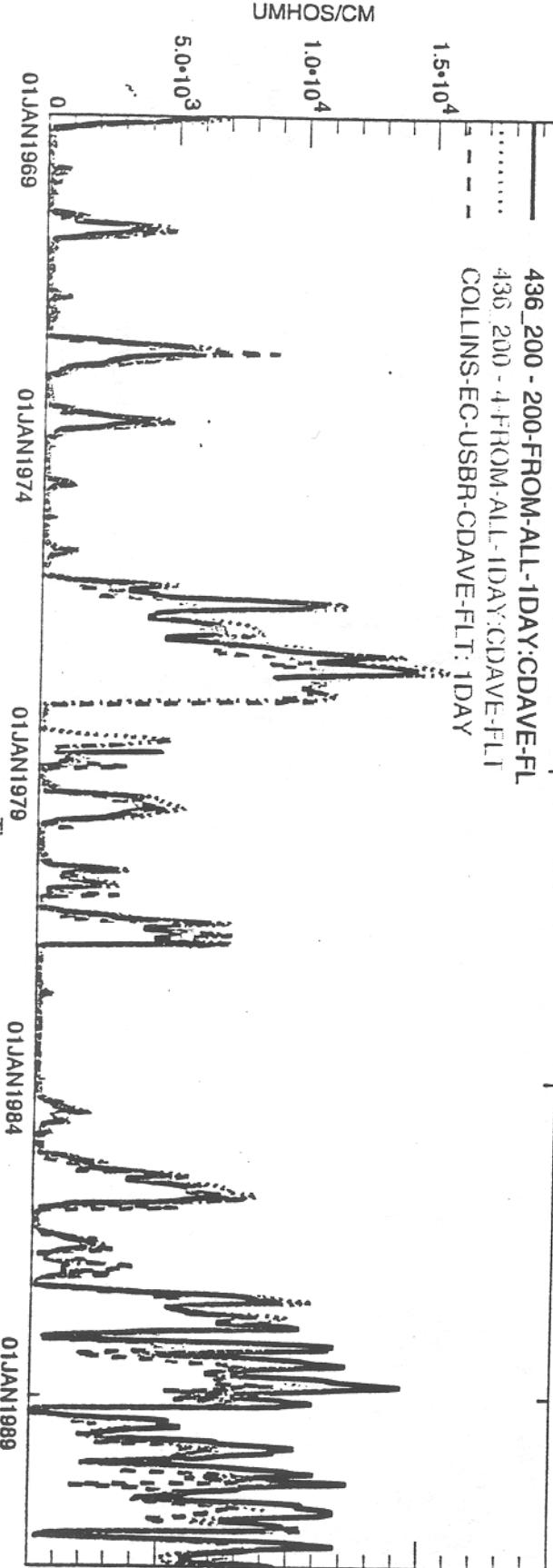


Time-value plot

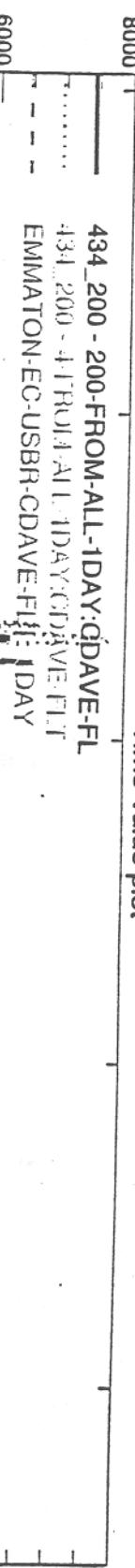
437_3200 - 200-FROM-ALL-1DAY:CDAVE-FL
 437_3200 - 4-FROM-ALL-1DAY:CDAVE-FL
 PITTSBURG-EC-USBR-CDAVE-FLT: 1DAY



Time-value plot

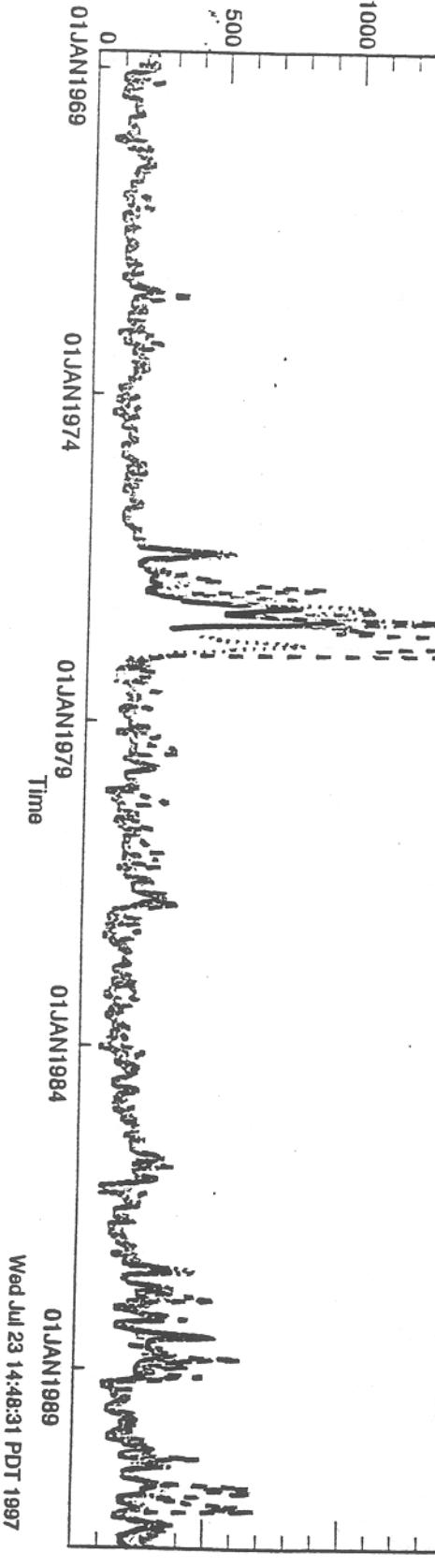
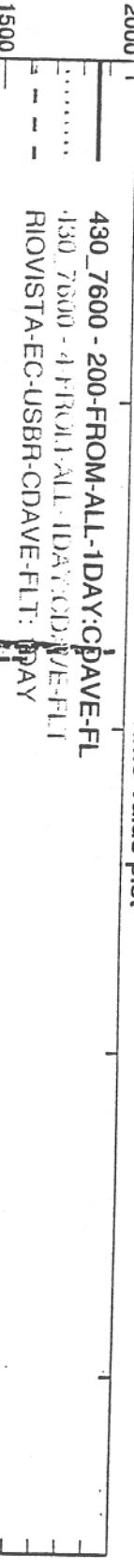


Time-value plot

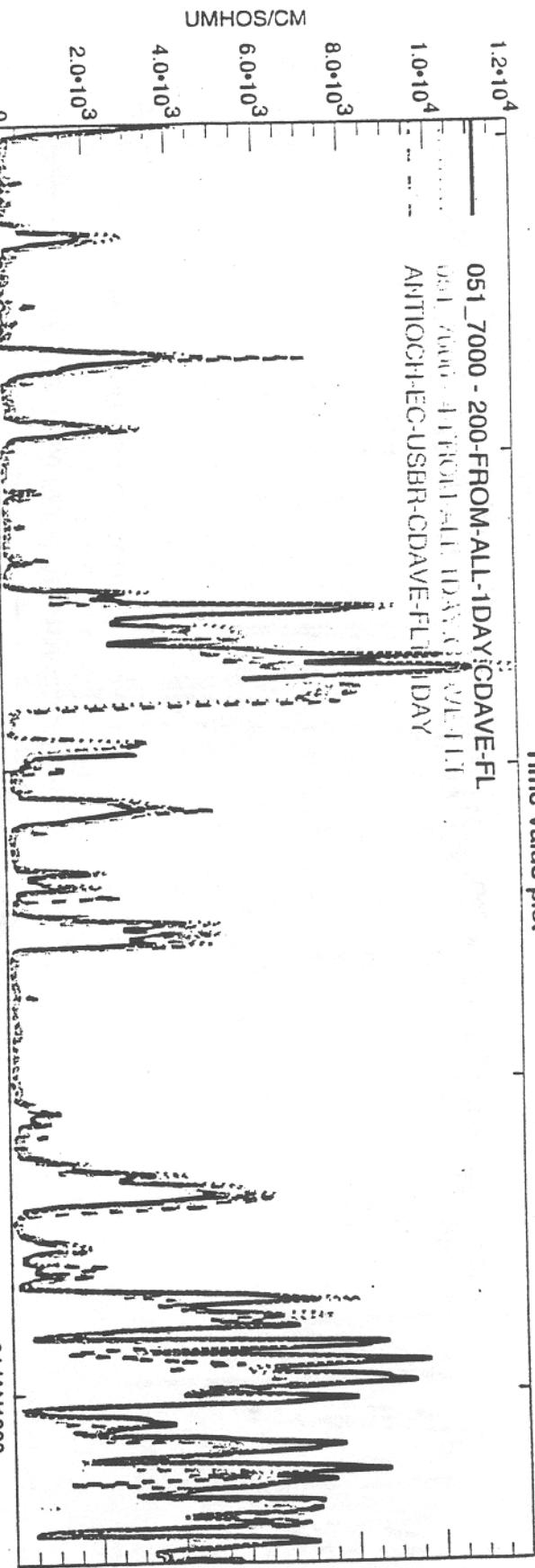


9-42

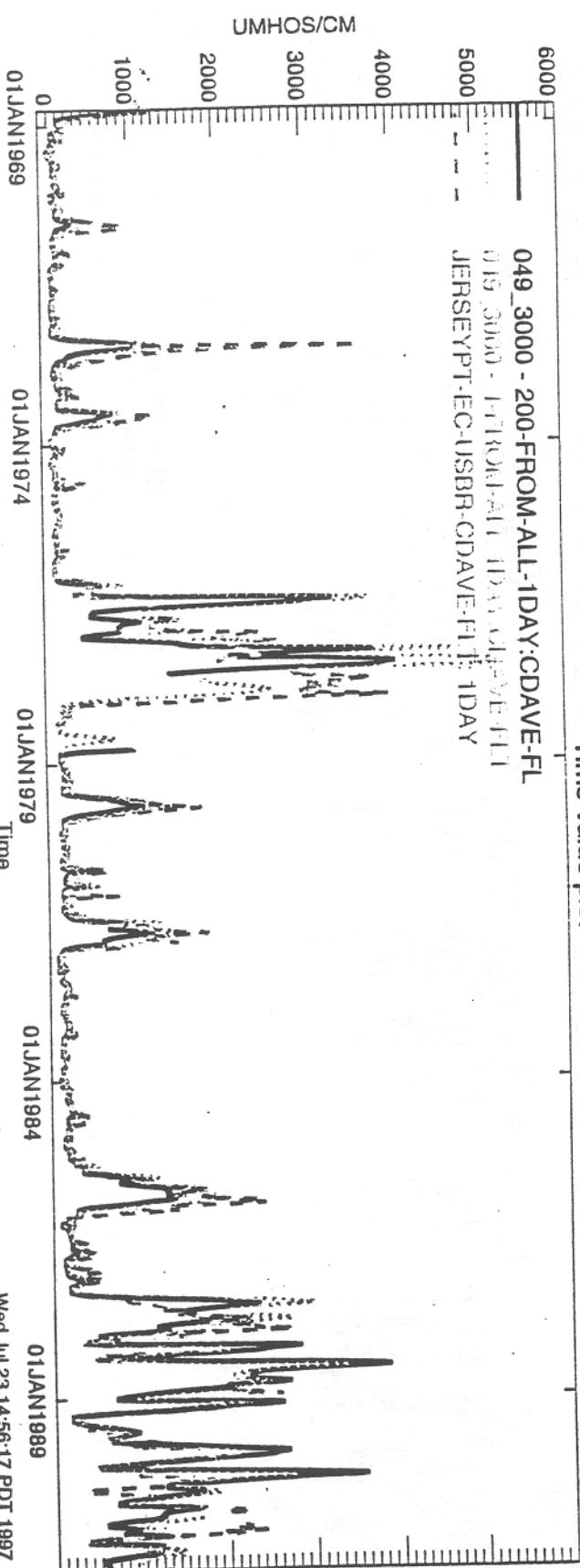
Time-value plot



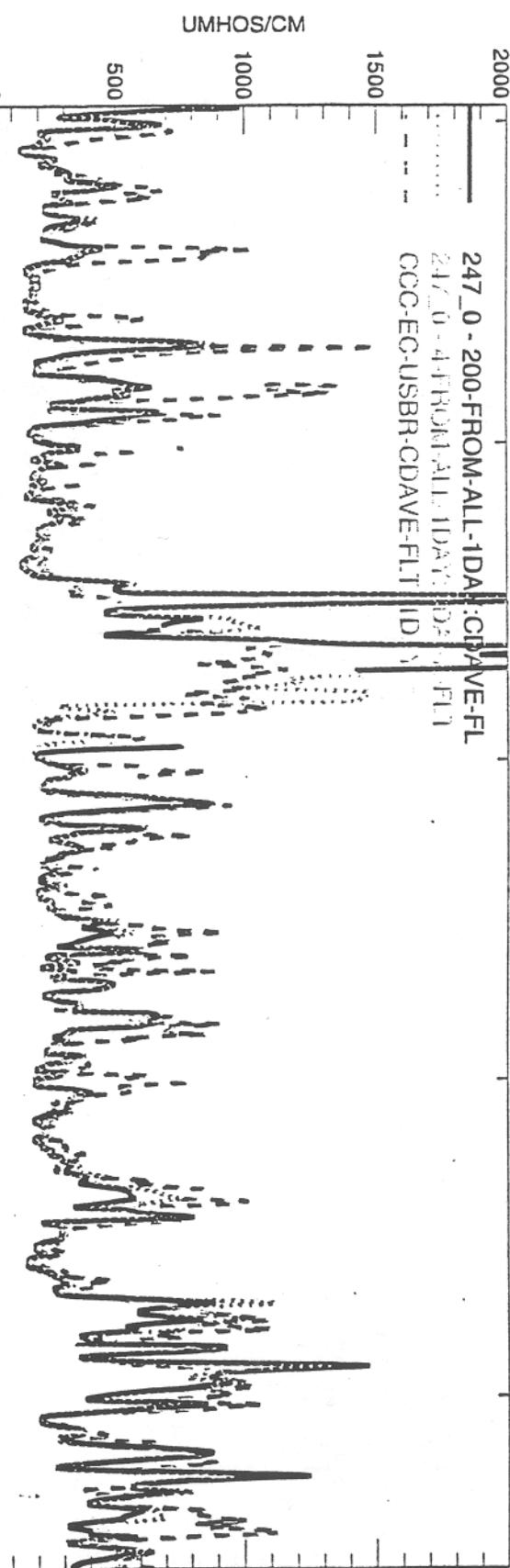
Time-value plot



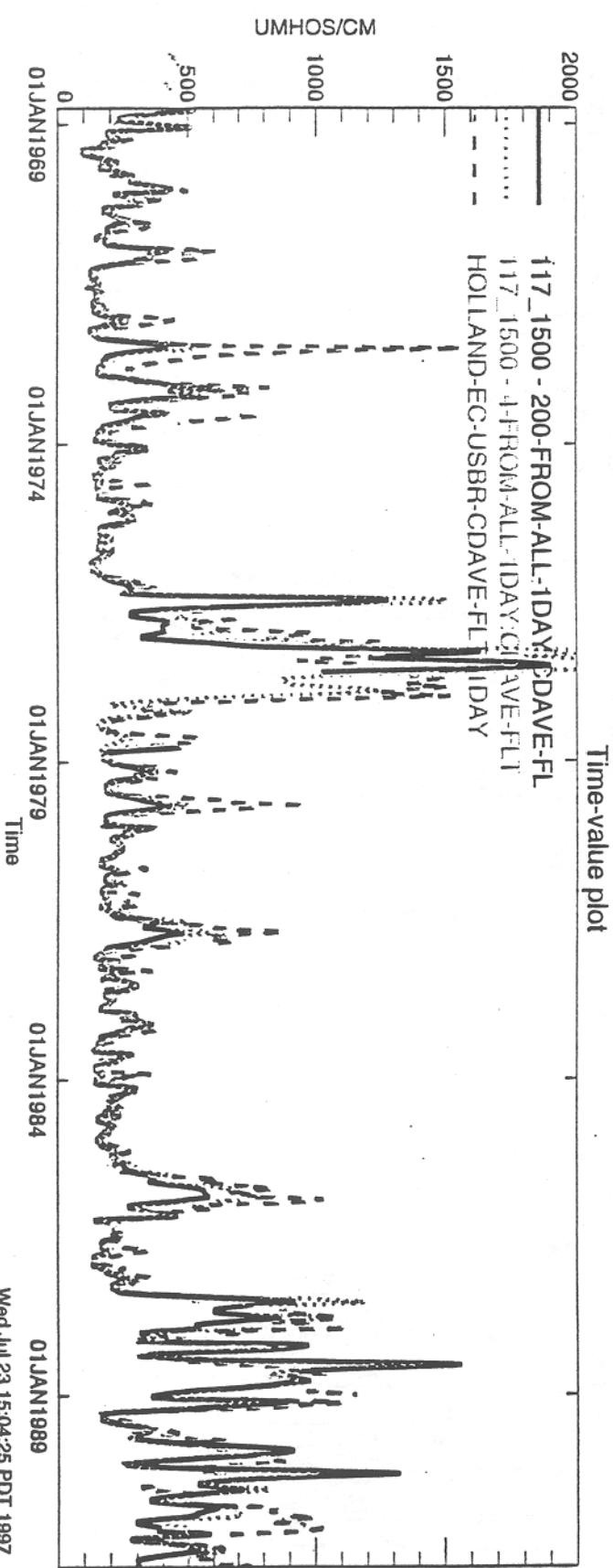
Time-value plot



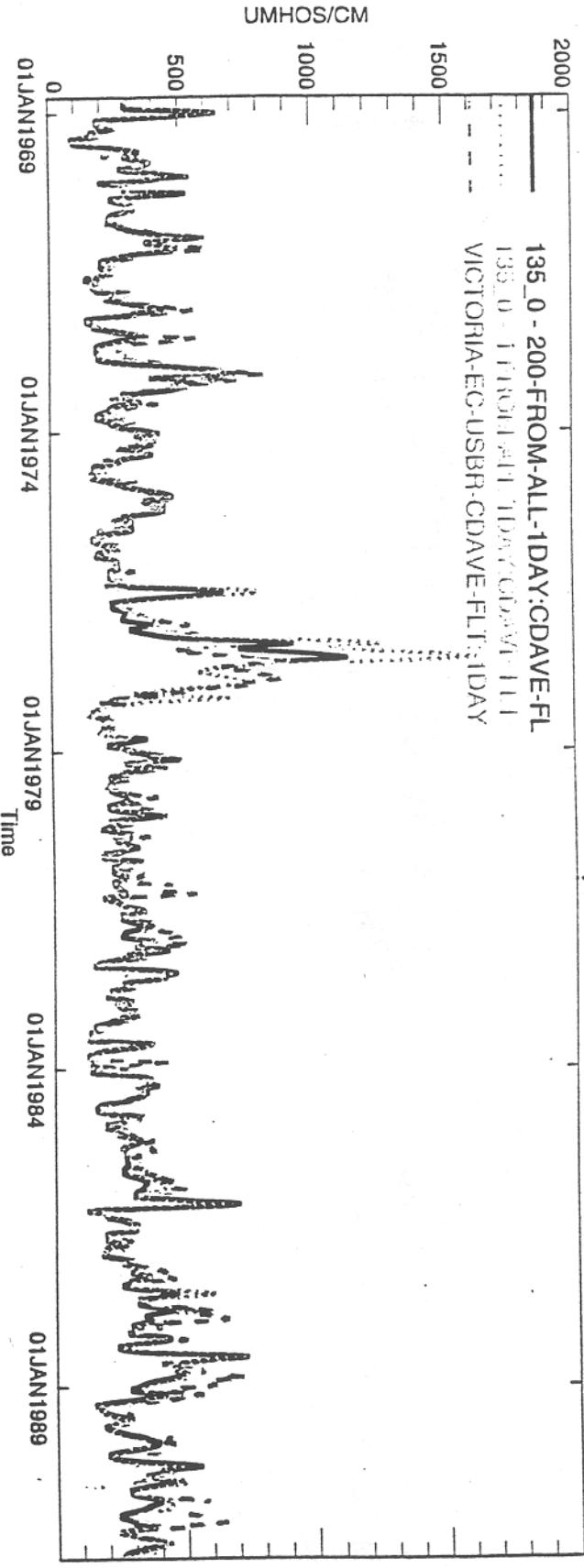
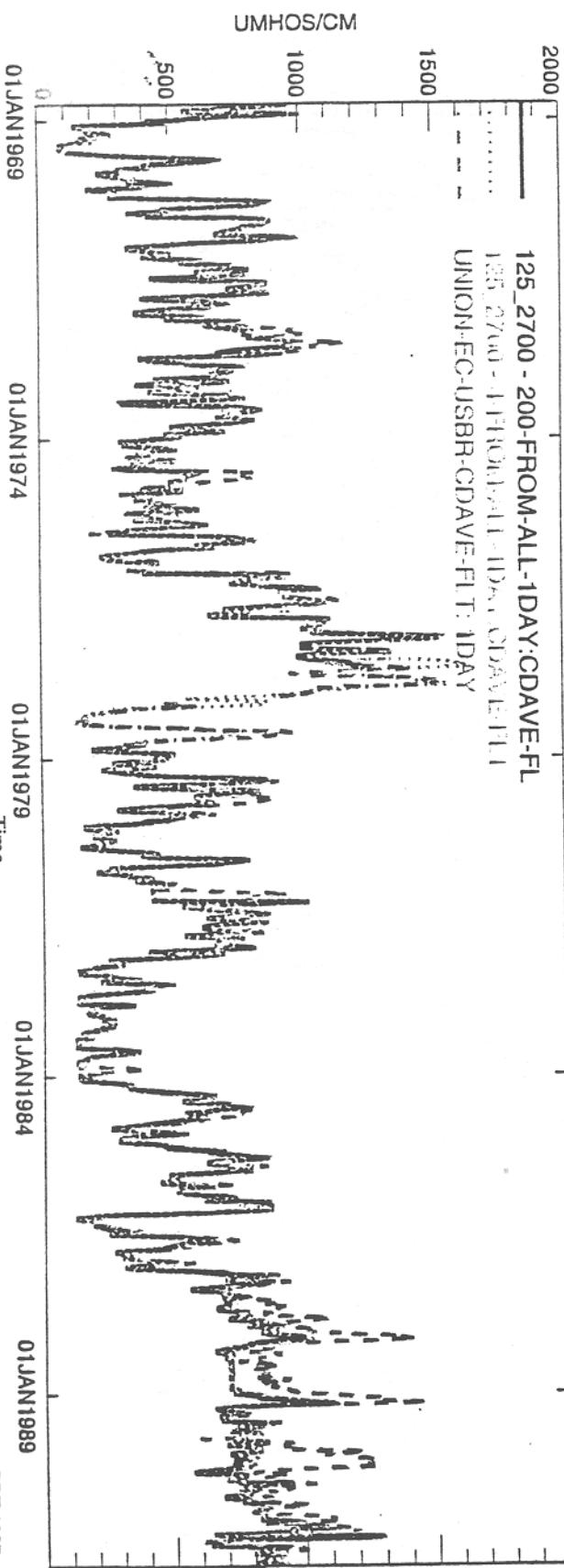
Time-value plot



9-44

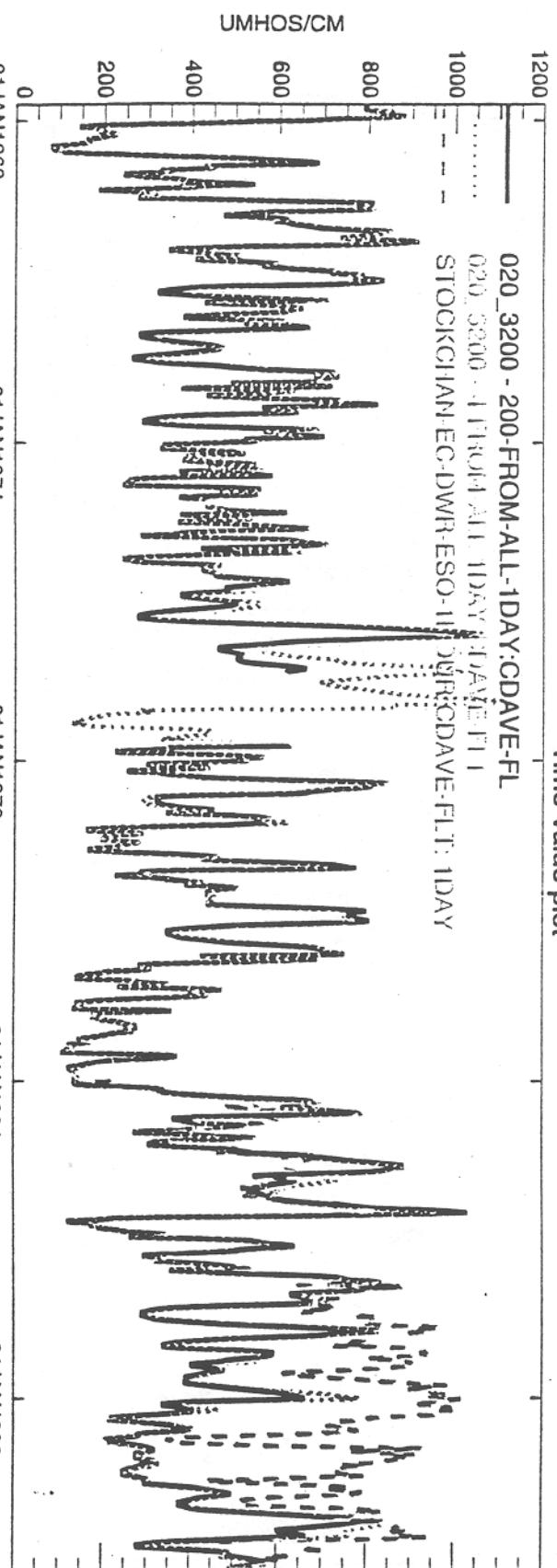


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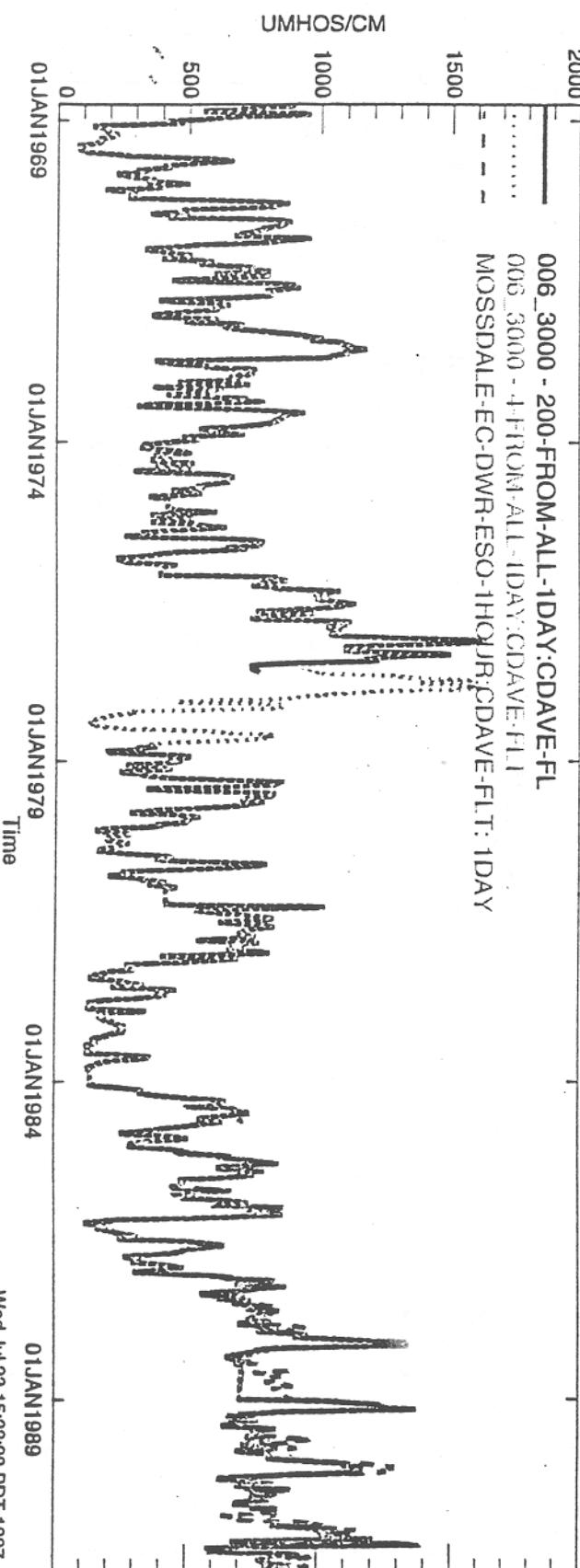


Time-value plot

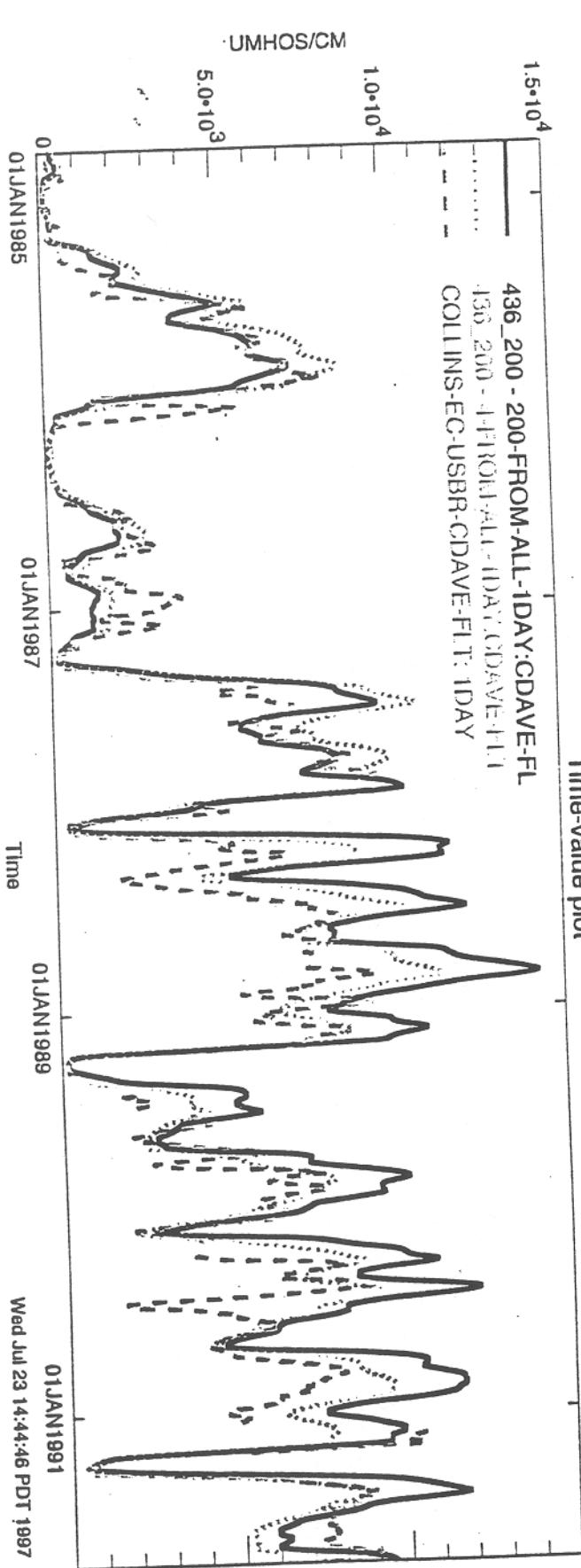
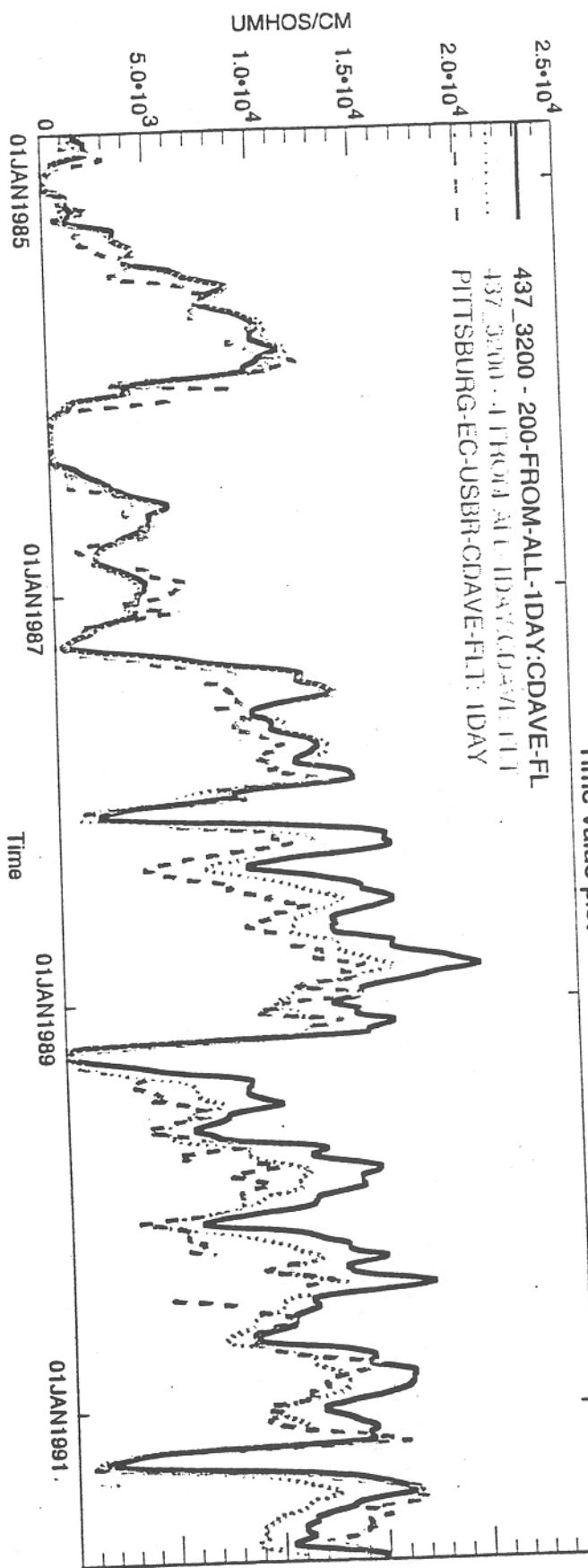
Time-value plot



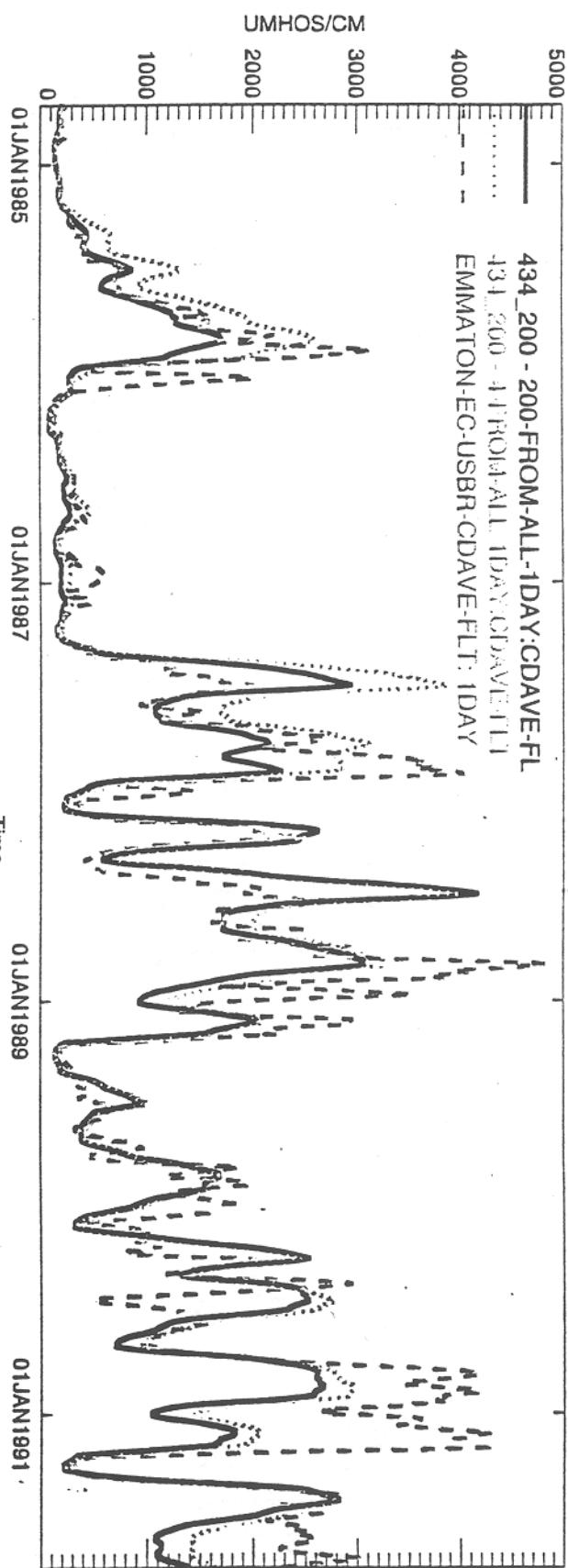
Time-value plot



Time-value plot

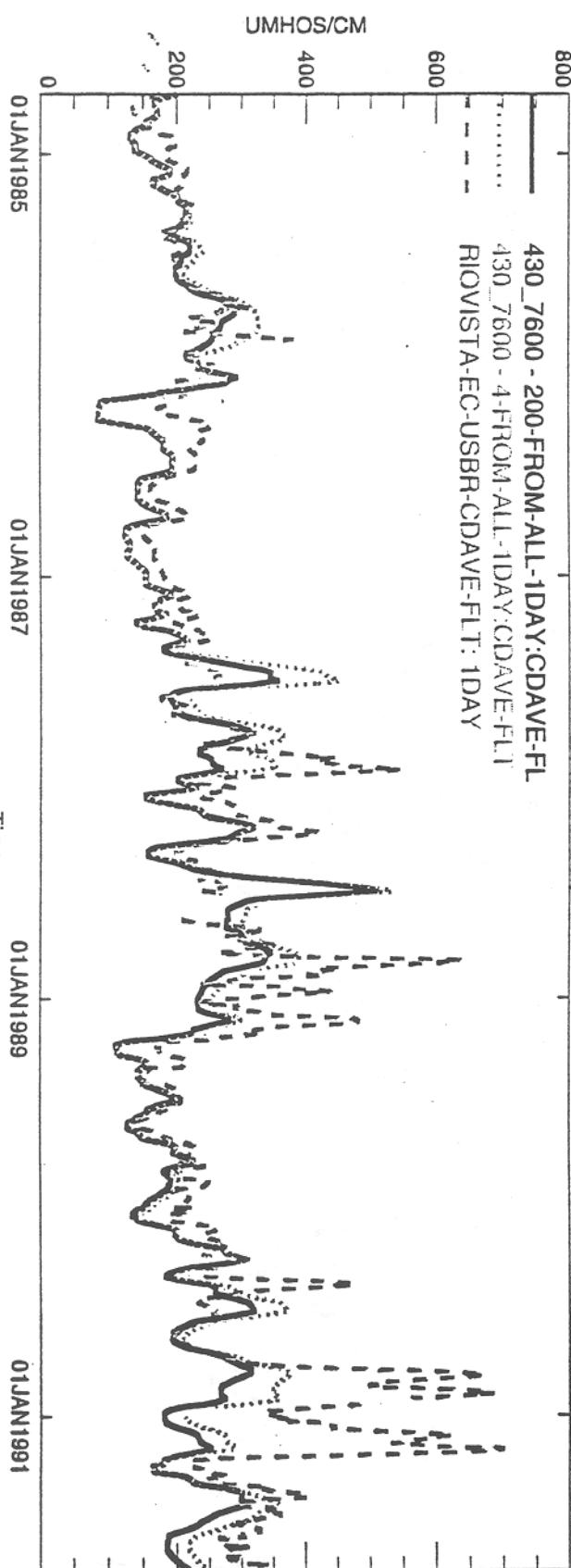


Time-value plot

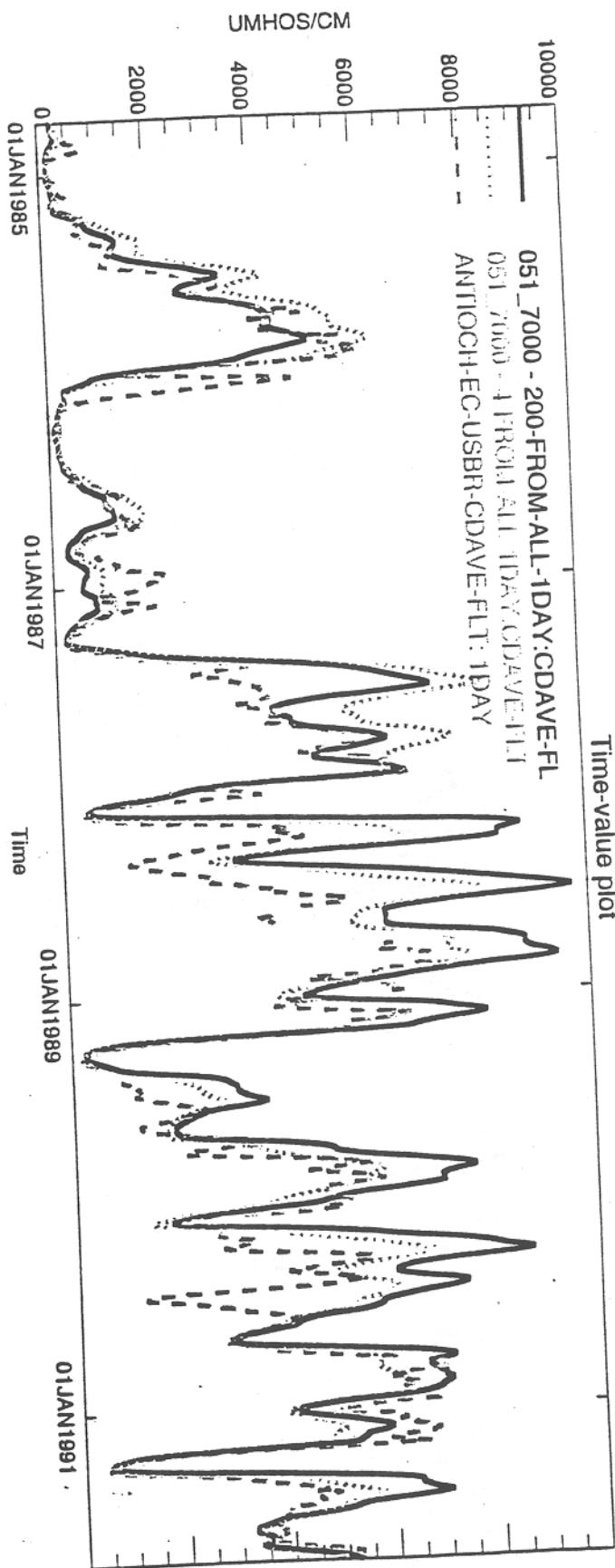


9-48

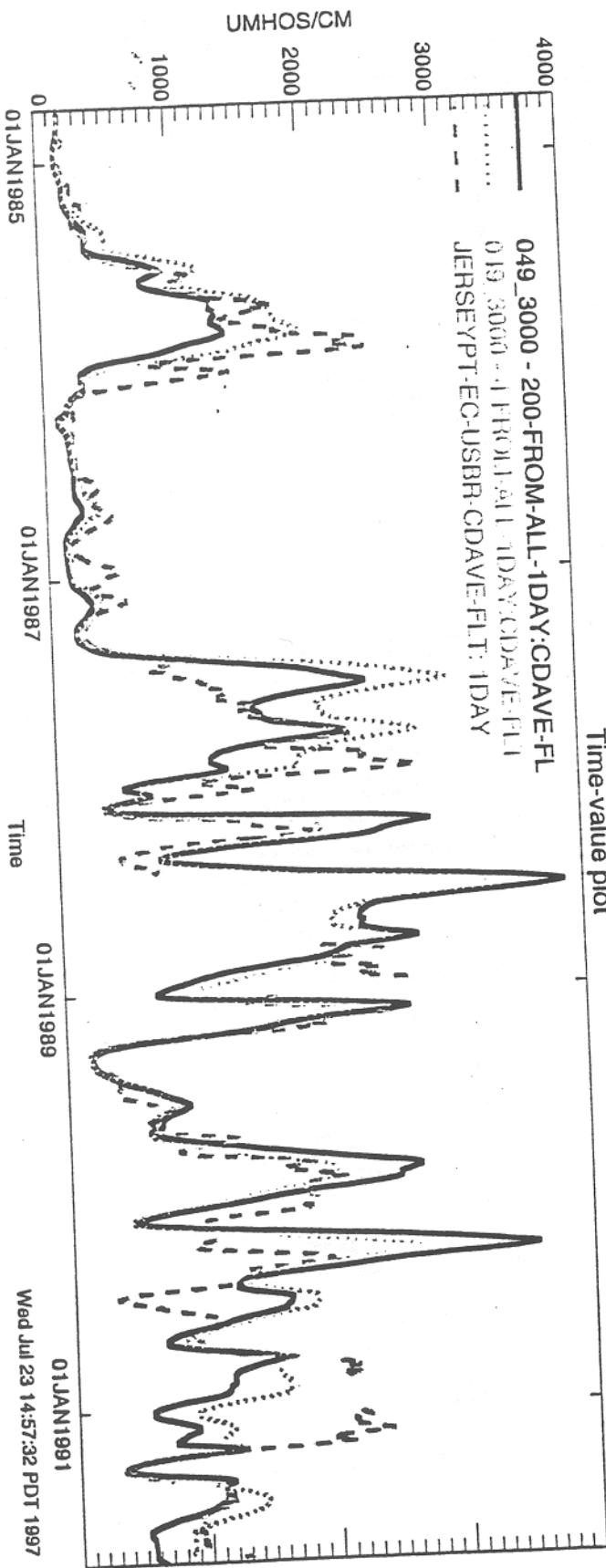
Time-value plot



Time-value plot



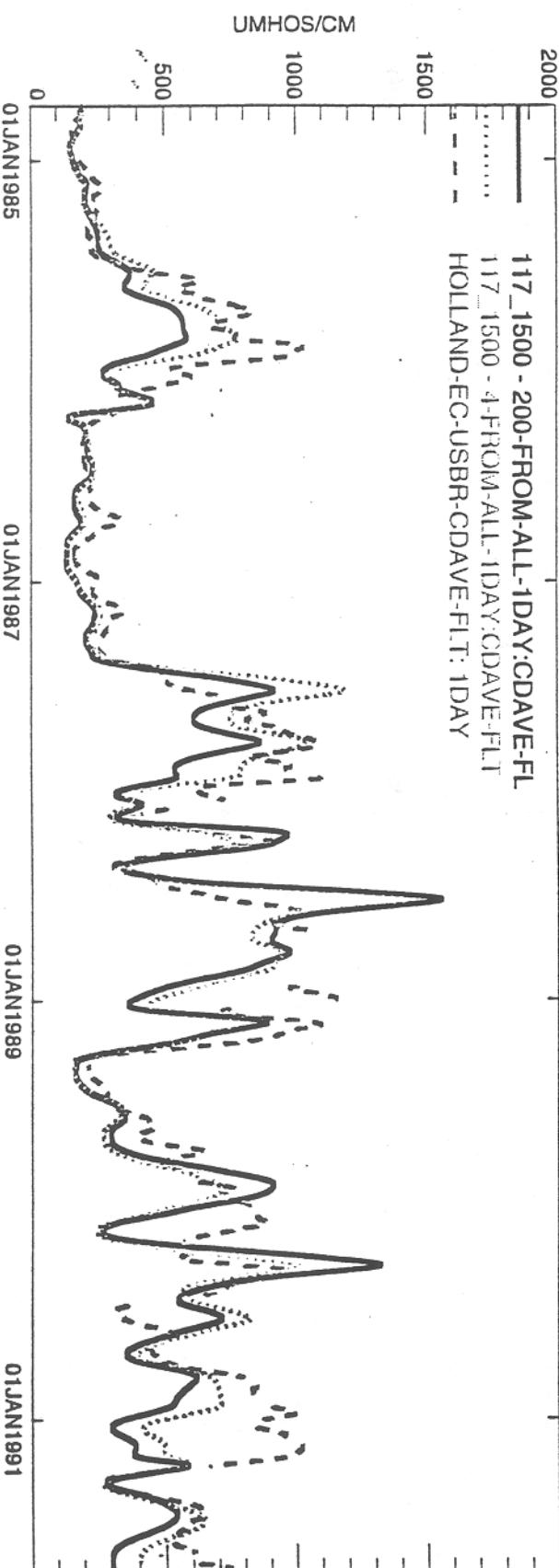
Time-value plot



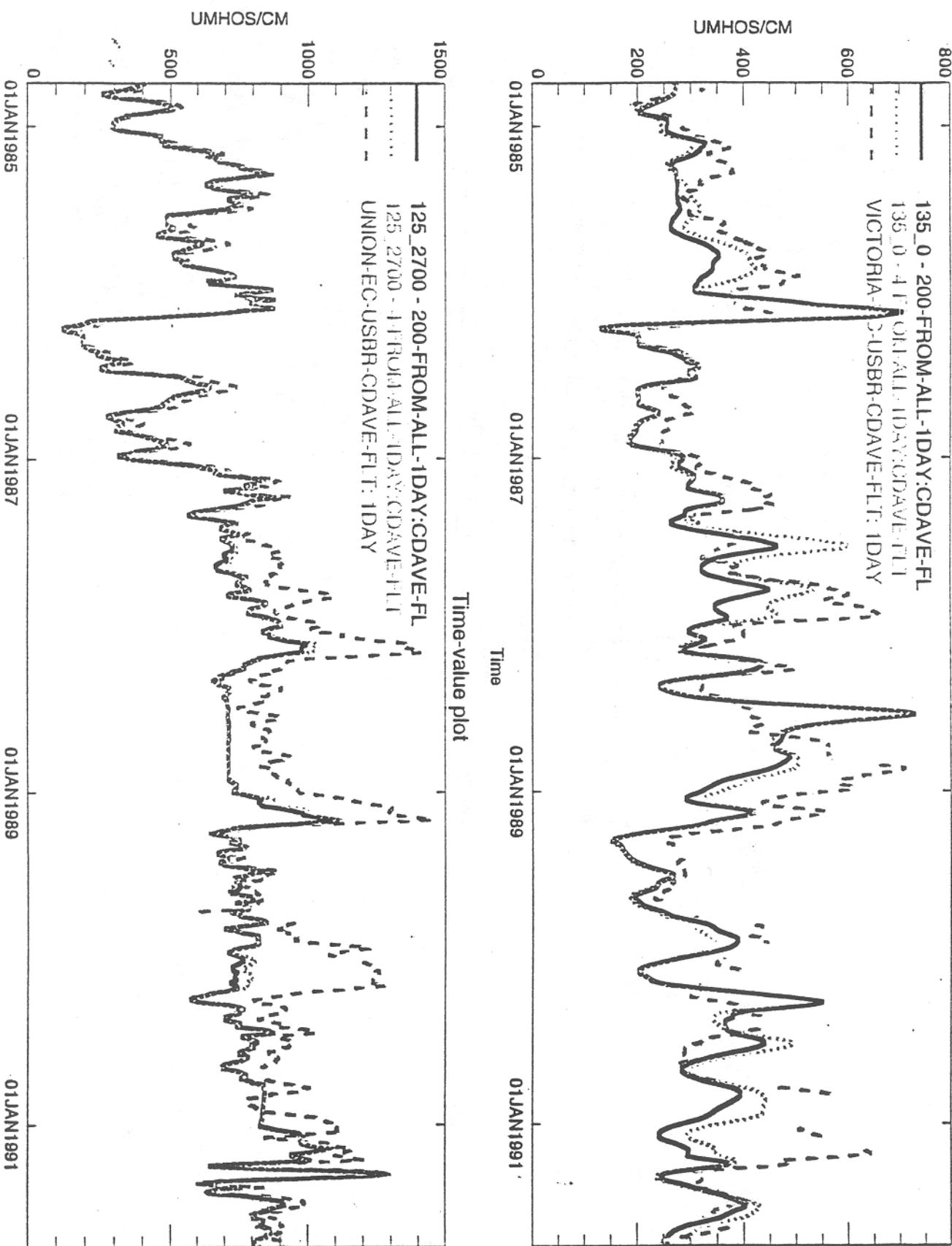
Time-value plot



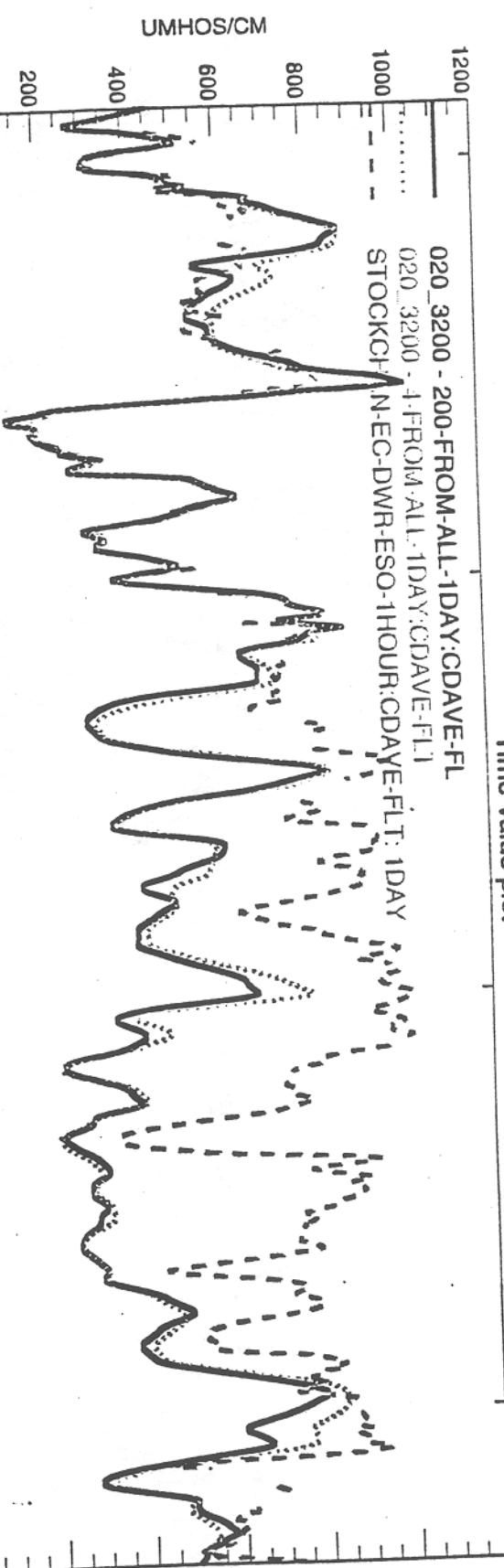
Time-value plot



Time-value plot



Time-value plot



Time-value plot

